

Further development of various equations concerning the Ramanujan Manuscript Book 1. New possible mathematical connections with various topics regarding the Dark Matter, the String Theory and the Supersymmetry Breaking. VIII

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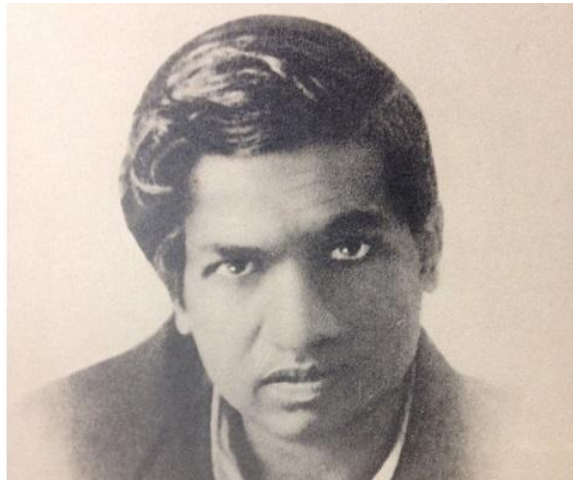
Abstract

In this research thesis, (part VIII) we analyze further equations concerning the Ramanujan Manuscript Book 1. We obtain new possible mathematical connections with various topics regarding the Dark Matter, the String Theory and the Supersymmetry Breaking.

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Srinivasa Ramanujan (1887-1920)



<https://www.moduscc.it/ramanujan-il-grande-matematico-indiano-13453-131115/>

Vesuvius landscape with gorse – Naples



<https://www.pinterest.it/pin/95068242114589901/>

From:

On the Zeros of the Davenport Heilbronn Function

S. A. Gritsenko - Received May 15, 2016 - ISSN 0081-5438, Proceedings of the Steklov Institute of Mathematics, 2017, Vol. 296, pp. 65–87.

A. A. Karatsuba, “On the zeros of arithmetic Dirichlet series without Euler product,” *Izv. Ross. Akad. Nauk, Ser. Mat.* 57 (5), 3–14 (1993)

We have:

Let

$$\kappa = \frac{\sqrt{10 - 2\sqrt{5}} - 2}{\sqrt{5} - 1}$$

and χ_1 be a character modulo 5 such that $\chi_1(2) = i$.

The Davenport–Heilbronn function $f(s)$ is defined by the equality

$$f(s) = \frac{1 - i\kappa}{2} L(s, \chi_1) + \frac{1 + i\kappa}{2} L(s, \bar{\chi}_1), \quad \text{where} \quad L(s, \chi) = \sum_{n=1}^{\infty} \frac{\chi(n)}{n^s}.$$

The function $f(s)$ satisfies the Riemann-type functional equation

$$g(s) = g(1 - s), \quad \text{where} \quad g(s) = \left(\frac{\pi}{5}\right)^{-s/2} \Gamma\left(\frac{s+1}{2}\right) f(s),$$

but there is no Euler product for it.

$$(\sqrt{10 - 2\sqrt{5}} - 2)/(\sqrt{5} - 1) = \kappa$$

Input:

$$\frac{\sqrt{10 - 2\sqrt{5}} - 2}{\sqrt{5} - 1}$$

Decimal approximation:

0.2840790438404122960282918323931261690910880884457375827591626661

...

0.28407904384.... = κ

Alternate forms:

$$\frac{1}{4} \left(\sqrt{10 - 2\sqrt{5}} - 2\sqrt{5} + \sqrt{5(10 - 2\sqrt{5})} - 2 \right)$$

$$\frac{1}{4} (1 + \sqrt{5}) \left(\sqrt{10 - 2\sqrt{5}} - 2 \right)$$

$$\frac{1}{2} \left(-1 - \sqrt{5} + \sqrt{2(5 + \sqrt{5})} \right)$$

Minimal polynomial:

$$x^4 + 2x^3 - 6x^2 - 2x + 1$$

Expanded forms:

$$\frac{\sqrt{10 - 2\sqrt{5}}}{\sqrt{5} - 1} - \frac{2}{\sqrt{5} - 1}$$

$$\frac{1}{4} \sqrt{10 - 2\sqrt{5}} + \frac{1}{4} \sqrt{5(10 - 2\sqrt{5})} + \frac{1}{2} (-1 - \sqrt{5})$$

For $((((\sqrt{10-2\sqrt{5}}-2)(\sqrt{5}-1)))) = 8\pi G$; $G = 0.011303146014$

Indeed:

$$(((\sqrt{10-2\sqrt{5}}-2)(\sqrt{5}-1)))/(8\pi)$$

Input:

$$\frac{\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}}{8\pi}$$

Result:

$$\frac{\sqrt{10-2\sqrt{5}}-2}{8(\sqrt{5}-1)\pi}$$

Decimal approximation:

0.0113031460140052147973750129442035744685760313920017808594909667
...

0.01130314.... = g (gravitational coupling constant)

Property:

$$\frac{-2 + \sqrt{10 - 2\sqrt{5}}}{8(-1 + \sqrt{5})\pi} \text{ is a transcendental number}$$

Alternate forms:

$$\frac{\sqrt{10-2\sqrt{5}}-2\sqrt{5}+\sqrt{5(10-2\sqrt{5})}-2}{32\pi}$$

$$-\frac{1 + \sqrt{5} - \sqrt{2(5 + \sqrt{5})}}{16\pi}$$

$$\frac{-1 - \sqrt{5} + \sqrt{2(5 + \sqrt{5})}}{16\pi}$$

Expanded forms:

$$-\frac{1}{16\pi} - \frac{\sqrt{5}}{16\pi} + \frac{\sqrt{10 - 2\sqrt{5}}}{32\pi} + \frac{\sqrt{5(10 - 2\sqrt{5})}}{32\pi}$$

$$\frac{\sqrt{10 - 2\sqrt{5}}}{8(\sqrt{5} - 1)\pi} - \frac{1}{4(\sqrt{5} - 1)\pi}$$

Series representations:

$$\frac{\sqrt{10 - 2\sqrt{5}} - 2}{(8\pi)(\sqrt{5} - 1)} = \frac{-2 + \sqrt{9 - 2\sqrt{5}} \sum_{k=0}^{\infty} \binom{\frac{1}{2}}{k} (9 - 2\sqrt{5})^{-k}}{8\pi \left(-1 + \sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} \right)}$$

$$\frac{\sqrt{10 - 2\sqrt{5}} - 2}{(8\pi)(\sqrt{5} - 1)} = \frac{-2 + \sqrt{9 - 2\sqrt{5}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (9 - 2\sqrt{5})^{-k}}{k!}}{8\pi \left(-1 + \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)_k \left(-\frac{1}{2}\right)_k}{k!} \right)}$$

$$\frac{\sqrt{10-2\sqrt{5}}-2}{(8\pi)(\sqrt{5}-1)} = \frac{-2+\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (10-2\sqrt{5}-z_0)^k z_0^{-k}}{k!}}{8\pi \left(-1+\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!}\right)}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

We note that:

$$(((\sqrt{10-2\sqrt{5}}-2))/(\sqrt{5}-1))*((2i(\sqrt{5}-1)t + \sqrt{5}-1)/(2(\sqrt{2(5-\sqrt{5})}-2)))$$

Input:

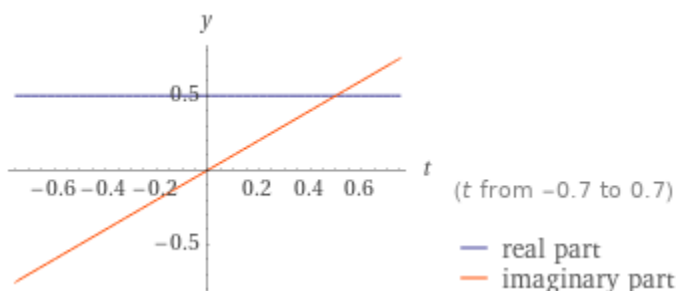
$$\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1} \times \frac{2i(\sqrt{5}-1)t + \sqrt{5}-1}{2\left(\sqrt{2(5-\sqrt{5})}-2\right)}$$

i is the imaginary unit

Exact result:

$$\frac{\left(\sqrt{10-2\sqrt{5}}-2\right)\left(2i\left(\sqrt{5}-1\right)t + \sqrt{5}-1\right)}{2\left(\sqrt{5}-1\right)\left(\sqrt{2\left(5-\sqrt{5}\right)}-2\right)}$$

Plot:



Alternate form assuming $t > 0$:

$$\begin{aligned} & \frac{i \sqrt{10 - 2\sqrt{5}} t}{\sqrt{2(5 - \sqrt{5})} - 2} - \frac{2 i t}{\sqrt{2(5 - \sqrt{5})} - 2} + \\ & \frac{\sqrt{5(10 - 2\sqrt{5})}}{2(\sqrt{5} - 1) \left(\sqrt{2(5 - \sqrt{5})} - 2 \right)} - \frac{\sqrt{10 - 2\sqrt{5}}}{2(\sqrt{5} - 1) \left(\sqrt{2(5 - \sqrt{5})} - 2 \right)} - \\ & \frac{\sqrt{5}}{(\sqrt{5} - 1) \left(\sqrt{2(5 - \sqrt{5})} - 2 \right)} + \frac{1}{(\sqrt{5} - 1) \left(\sqrt{2(5 - \sqrt{5})} - 2 \right)} \end{aligned}$$

Alternate forms:

$$\frac{1}{8} (1 + \sqrt{5}) \left(2 i \sqrt{2(3 - \sqrt{5})} t + \sqrt{5} - 1 \right)$$

$$\frac{1}{2} (1 + 2 i t)$$

$$\frac{1}{2} + i t$$

$1/2 + it$ = real part of every nontrivial zero of the Riemann zeta function

Derivative:

$$\frac{d}{dt} \left(\frac{\left(\sqrt{10 - 2\sqrt{5}} - 2 \right) (2 i (\sqrt{5} - 1) t + \sqrt{5} - 1)}{(\sqrt{5} - 1) \left(2 \left(\sqrt{2(5 - \sqrt{5})} - 2 \right) \right)} \right) = i$$

Indefinite integral:

$$\int \frac{(\sqrt{10-2\sqrt{5}}-2)(2i(\sqrt{5}-1)t+\sqrt{5}-1)}{(\sqrt{5}-1)\left(2\left(\sqrt{2(5-\sqrt{5})}-2\right)\right)} dt = \frac{t}{2} + \frac{it^2}{2} + \text{constant}$$

And again:

$$(((\sqrt{(10-2\sqrt{5})}-2))/(2x))) * ((2i(\sqrt{5}-1)t + \sqrt{5}-1)/(2(\sqrt{2(5-\sqrt{5})}-2))) = (1/2 + it)$$

Input:

$$\frac{\sqrt{10-2\sqrt{5}}-2}{2x} \times \frac{2i(\sqrt{5}-1)t+\sqrt{5}-1}{2\left(\sqrt{2(5-\sqrt{5})}-2\right)} = \frac{1}{2} + it$$

i is the imaginary unit

Exact result:

$$\frac{(\sqrt{10-2\sqrt{5}}-2)(2i(\sqrt{5}-1)t+\sqrt{5}-1)}{4\left(\sqrt{2(5-\sqrt{5})}-2\right)x} = \frac{1}{2} + it$$

Alternate form assuming t and x are real:

$$\frac{\sqrt{5}-1}{x} = 2$$

Alternate form:

$$\frac{(\sqrt{5} - 1)(1 + 2it)}{4x} = \frac{1}{2} + it$$

Alternate form assuming t and x are positive:

$$2x + 1 = \sqrt{5}$$

Expanded forms:

$$\begin{aligned} & \frac{i\sqrt{5(10-2\sqrt{5})}t}{2\left(\sqrt{2(5-\sqrt{5})}-2\right)x} - \frac{i\sqrt{10-2\sqrt{5}}t}{2\left(\sqrt{2(5-\sqrt{5})}-2\right)x} - \frac{i\sqrt{5}t}{\left(\sqrt{2(5-\sqrt{5})}-2\right)x} + \\ & \frac{it}{\left(\sqrt{2(5-\sqrt{5})}-2\right)x} + \frac{\sqrt{5(10-2\sqrt{5})}}{4\left(\sqrt{2(5-\sqrt{5})}-2\right)x} - \frac{\sqrt{10-2\sqrt{5}}}{4\left(\sqrt{2(5-\sqrt{5})}-2\right)x} - \\ & \frac{\sqrt{5}}{2\left(\sqrt{2(5-\sqrt{5})}-2\right)x} + \frac{1}{2\left(\sqrt{2(5-\sqrt{5})}-2\right)x} = \frac{1}{2} + it \end{aligned}$$

$$\frac{i\sqrt{5}t}{2x} - \frac{it}{2x} + \frac{\sqrt{5}}{4x} - \frac{1}{4x} = \frac{1}{2} + it$$

Solutions:

$$t = \frac{i}{2}, \quad x \neq 0$$

$$x = \frac{\sqrt{5}}{2} - \frac{1}{2}$$

Input:

$$\frac{\sqrt{5}}{2} - \frac{1}{2}$$

Decimal approximation:

0.6180339887498948482045868343656381177203091798057628621354486227
...

$$0.6180339887\dots = \frac{1}{\phi}$$

Solution for the variable x:

$$x = \frac{-2i\sqrt{5}t + 2it - \sqrt{5} + 1}{-2 - 4it}$$

Implicit derivatives:

$$\frac{\partial x(t)}{\partial t} = \frac{2(-1 + \sqrt{5} - 2x)x}{(-1 + \sqrt{5})(-i + 2t)}$$

$$\frac{\partial t(x)}{\partial x} = \frac{(-1 + \sqrt{5})(-i + 2t)}{2(-1 + \sqrt{5} - 2x)x}$$

Dark Energy and Dark Matter

We consider $\Lambda = 1.1056 \times 10^{-52}$ that is the value of the Cosmological Constant and 299792458 , that is the value of the speed of light in m/s , the terms of the Einstein equation $E = mc^2$ ($E = 1.1056 \times 10^{-52}$ ($\Lambda = \text{Dark Energy}$)). Thence, we can to obtain the mass m :

$$(1.1056 \times 10^{-52}) / (299792458)^2$$

Input interpretation

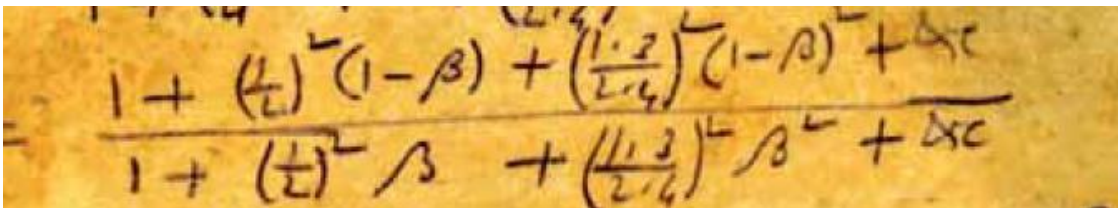
$$\frac{1.1056 \times 10^{-52}}{299792458^2}$$

Result

$$1.2301459019728805386116738651359598467212878595555184012098... \times 10^{-69}$$

$$1.2301459019... \times 10^{-69}$$

From (**Ramanujan Manuscript Book 1 – Srinivasa Ramanujan**):



$$= \frac{1 + \left(\frac{1}{2}\right)^2 (1-\beta) + \left(\frac{1 \cdot 2}{2 \cdot 4}\right)^2 (1-\beta)^2 + \Delta c}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{1 \cdot 2}{2 \cdot 4}\right)^2 \beta^2 + \Delta c}$$

$$(((1 + (1/2)^2 (1-\beta) + ((1 \cdot 3)/(2 \cdot 4))^2 (1-\beta)^2))) / (((1 + (1/2)^2 * \beta + ((1 \cdot 3)/(2 \cdot 4))^2 \beta^2)))$$

Input

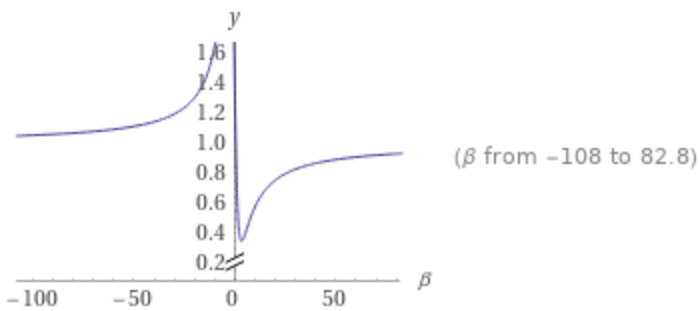
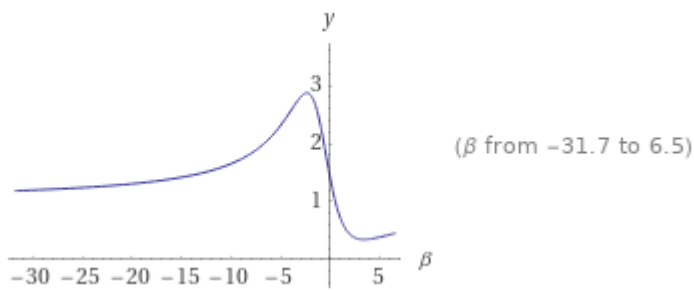
$$\frac{1 + \left(\frac{1}{2}\right)^2 (1 - \beta) + \left(\frac{1 \times 3}{2 \times 4}\right)^2 (1 - \beta)^2}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{1 \times 3}{2 \times 4}\right)^2 \beta^2}$$

Result

$$\frac{\frac{9}{64} (1 - \beta)^2 + \frac{1 - \beta}{4} + 1}{\frac{9 \beta^2}{64} + \frac{\beta}{4} + 1}$$

Plots

(figures that can be related to the open strings)



Alternate forms

$$\frac{9 \beta^2 - 34 \beta + 89}{9 \beta^2 + 16 \beta + 64}$$

$$\frac{25 - 50 \beta}{\beta (9 \beta + 16) + 64} + 1$$

$$1 - \frac{25(2\beta - 1)}{9\beta^2 + 16\beta + 64}$$

Expanded forms

$$\frac{9\beta^2}{64\left(\frac{9\beta^2}{64} + \frac{\beta}{4} + 1\right)} - \frac{17\beta}{32\left(\frac{9\beta^2}{64} + \frac{\beta}{4} + 1\right)} + \frac{89}{64\left(\frac{9\beta^2}{64} + \frac{\beta}{4} + 1\right)}$$

$$\frac{9\beta^2}{64\left(\frac{9\beta^2}{64} + \frac{\beta}{4} + 1\right)} - \frac{17\beta}{32\left(\frac{9\beta^2}{64} + \frac{\beta}{4} + 1\right)} + \frac{89}{9\beta^2 + 16\beta + 64}$$

Complex roots

$$\beta = \frac{17}{9} - \frac{16i\sqrt{2}}{9}$$

$$\beta = \frac{17}{9} + \frac{16i\sqrt{2}}{9}$$

Series expansion at $\beta=0$

$$\frac{89}{64} - \frac{225\beta}{256} + \frac{675\beta^2}{4096} + \frac{675\beta^3}{8192} - \frac{11475\beta^4}{262144} + O(\beta^5)$$

(Taylor series)

Series expansion at $\beta=\infty$

$$1 - \frac{50}{9\beta} + \frac{1025}{81\beta^2} + \frac{12400}{729\beta^3} + O\left(\left(\frac{1}{\beta}\right)^4\right)$$

(Laurent series)

Derivative

$$\frac{d}{d\beta} \left(\frac{1 + \left(\frac{1}{2}\right)^2 (1 - \beta) + \left(\frac{3}{2 \times 4}\right)^2 (1 - \beta)^2}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{3}{2 \times 4}\right)^2 \beta^2} \right) = \frac{450(\beta^2 - \beta - 8)}{(9\beta^2 + 16\beta + 64)^2}$$

Indefinite integral

$$\int \frac{1 + \frac{1-\beta}{4} + \frac{9}{64} (1 - \beta)^2}{1 + \frac{\beta}{4} + \frac{9\beta^2}{64}} d\beta =$$
$$-\frac{25}{9} \log(9\beta^2 + 16\beta + 64) + \beta + \frac{625 \tan^{-1}\left(\frac{9\beta+8}{16\sqrt{2}}\right)}{144\sqrt{2}} + \text{constant}$$

$\tan^{-1}(x)$ is the inverse tangent function

$\log(x)$ is the natural logarithm

Global maximum

$$\max \left\{ \frac{1 + \left(\frac{1}{2}\right)^2 (1 - \beta) + \left(\frac{3}{2 \times 4}\right)^2 (1 - \beta)^2}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{3}{2 \times 4}\right)^2 \beta^2} \right\} = \frac{1649 + 225\sqrt{33}}{1024} \text{ at } \beta = \frac{1}{2} - \frac{\sqrt{33}}{2}$$

Global minimum

$$\min \left\{ \frac{1 + \left(\frac{1}{2}\right)^2 (1 - \beta) + \left(\frac{3}{2 \times 4}\right)^2 (1 - \beta)^2}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{3}{2 \times 4}\right)^2 \beta^2} \right\} = \frac{1649 - 225\sqrt{33}}{1024} \text{ at } \beta = \frac{1}{2} + \frac{\sqrt{33}}{2}$$

Limit

$$\lim_{\beta \rightarrow \pm\infty} \frac{1 + \frac{1-\beta}{4} + \frac{9}{64} (1-\beta)^2}{1 + \frac{\beta}{4} + \frac{9\beta^2}{64}} = 1$$

Series representations

$$\frac{1 + \frac{1-\beta}{4} + \frac{9}{64} (1-\beta)^2}{1 + \frac{\beta}{4} + \frac{9\beta^2}{64}} = \frac{89}{64} + \sum_{n=1}^{\infty} \beta^n \frac{25}{2^{17/2-3n} \left((-1-2i\sqrt{2})^n (-17i+2\sqrt{2}) + (-1+2i\sqrt{2})^n (17i+2\sqrt{2}) \right)}$$

$$\begin{aligned} & \frac{1 + \frac{1-\beta}{4} + \frac{9}{64} (1-\beta)^2}{1 + \frac{\beta}{4} + \frac{9\beta^2}{64}} = \\ & \frac{64}{89} + \sum_{n=1}^{\infty} \frac{1}{32\sqrt{2}} (-1+\beta)^n (-25) \left(89^{-1-n} \left((-17+16i\sqrt{2})^n (-161i+16\sqrt{2}) + \right. \right. \\ & \quad \left. \left. (-17-16i\sqrt{2})^n (161i+16\sqrt{2}) \right) \right) \end{aligned}$$

We perform the following calculations:

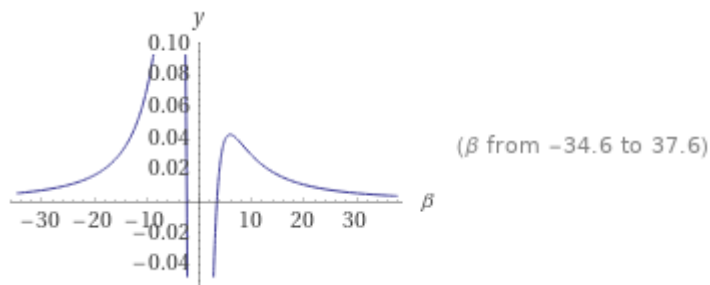
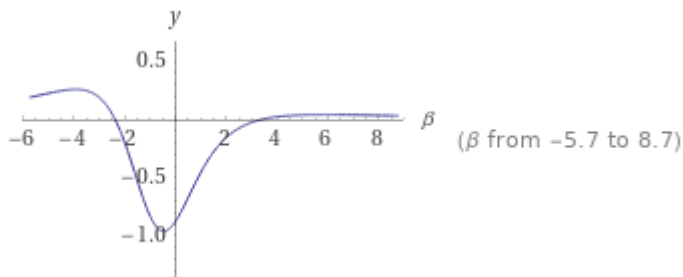
$$\text{derivative}(((1+(1/2)^2 (1-\beta) + ((1*3)/(2*4))^2 (1-\beta)^2))) / (((1+(1/2)^2 * \beta + ((1*3)/(2*4))^2 \beta^2)))$$

Derivative

$$\frac{d}{d\beta} \left(\frac{1 + \left(\frac{1}{2}\right)^2 (1-\beta) + \left(\frac{3}{2*4}\right)^2 (1-\beta)^2}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{3}{2*4}\right)^2 \beta^2} \right) = \frac{450(\beta^2 - \beta - 8)}{(9\beta^2 + 16\beta + 64)^2}$$

Plots

(figures that can be related to the open strings)



Alternate forms

$$\frac{450 ((\beta - 1) \beta - 8)}{(\beta (9 \beta + 16) + 64)^2}$$

$$\frac{\beta (450 \beta - 450) - 3600}{\beta (\beta (\beta (81 \beta + 288) + 1408) + 2048) + 4096}$$

Partial fraction expansion

$$\frac{50}{9 \beta^2 + 16 \beta + 64} - \frac{50 (25 \beta + 136)}{(9 \beta^2 + 16 \beta + 64)^2}$$

Expanded forms

$$\frac{450 \beta^2}{81 \beta^4 + 288 \beta^3 + 1408 \beta^2 + 2048 \beta + 4096} - \frac{450 \beta}{81 \beta^4 + 288 \beta^3 + 1408 \beta^2 + 2048 \beta + 4096} - \frac{3600}{81 \beta^4 + 288 \beta^3 + 1408 \beta^2 + 2048 \beta + 4096}$$

$$\frac{450 \beta^2 - 450 \beta - 3600}{81 \beta^4 + 288 \beta^3 + 1408 \beta^2 + 2048 \beta + 4096}$$

Roots

$$\beta = \frac{1}{2} - \frac{\sqrt{33}}{2}$$

$$\beta = \frac{1}{2} + \frac{\sqrt{33}}{2}$$

Series expansion at $\beta=0$

$$-\frac{225}{256} + \frac{675 \beta}{2048} + \frac{2025 \beta^2}{8192} - \frac{11475 \beta^3}{65536} - \frac{3375 \beta^4}{1048576} + O(\beta^5)$$

(Taylor series)

Series expansion at $\beta=\infty$

$$\frac{50}{9 \beta^2} - \frac{2050}{81 \beta^3} - \frac{12400}{243 \beta^4} + \frac{3155200}{6561 \beta^5} + O\left(\left(\frac{1}{\beta}\right)^6\right)$$

(Laurent series)

Indefinite integral

$$\int \frac{450(-8 - \beta + \beta^2)}{(64 + 16\beta + 9\beta^2)^2} d\beta = \frac{25 - 50\beta}{9\beta^2 + 16\beta + 64} + \text{constant}$$

Local maxima

$$\max\left\{\frac{450(\beta^2 - \beta - 8)}{(9\beta^2 + 16\beta + 64)^2}\right\} \approx 0.26070 \text{ at } \beta \approx -3.9238$$

$$\max\left\{\frac{450(\beta^2 - \beta - 8)}{(9\beta^2 + 16\beta + 64)^2}\right\} \approx 0.042292 \text{ at } \beta \approx 5.8856$$

Local minimum

$$\min\left\{\frac{450(\beta^2 - \beta - 8)}{(9\beta^2 + 16\beta + 64)^2}\right\} \approx -0.96217 \text{ at } \beta \approx -0.46188$$

Limit

$$\lim_{\beta \rightarrow \pm\infty} \frac{450(-8 - \beta + \beta^2)}{(64 + 16\beta + 9\beta^2)^2} = 0$$

Definite integral

$$\int_0^\infty \frac{450(-8 - \beta + \beta^2)}{(64 + 16\beta + 9\beta^2)^2} d\beta = -\frac{25}{64} = -0.390625$$

From:

$$\frac{d}{d\beta} \left(\frac{1 + \left(\frac{1}{2}\right)^2 (1 - \beta) + \left(\frac{3}{2 \times 4}\right)^2 (1 - \beta)^2}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{3}{2 \times 4}\right)^2 \beta^2} \right) = \frac{450 (\beta^2 - \beta - 8)}{(9 \beta^2 + 16 \beta + 64)^2}$$

we obtain, for $\beta = 8.7$ and 37.6 :

$$(450 (-8 - 8.7 + 8.7^2)) / (64 + 16 \cdot 8.7 + 9 \cdot 8.7^2)^2$$

Input

$$\frac{450 (-8 - 8.7 + 8.7^2)}{(64 + 16 \times 8.7 + 9 \times 8.7^2)^2}$$

Result

0.0339377949190686866502717045312159360154663404711556830674890395

...

0.033937794919....

$$(450 (-8 - 37.6 + 37.6^2)) / (64 + 16 \cdot 37.6 + 9 \cdot 37.6^2)^2$$

Input

$$\frac{450 (-8 - 37.6 + 37.6^2)}{(64 + 16 \times 37.6 + 9 \times 37.6^2)^2}$$

Result

0.0034341920297328709820193684390072521962041927464073680700048781

...

0.00343419202....

From which:

$$((((450(-8 - 8.7 + 8.7^2))/(64 + 16 \cdot 8.7 + 9 \cdot 8.7^2)^2 + (450(-8 - 37.6 + 37.6^2))/(64 + 16 \cdot 37.6 + 9 \cdot 37.6^2)^2)))^{48}$$

Input

$$\left(\frac{450(-8 - 8.7 + 8.7^2)}{(64 + 16 \times 8.7 + 9 \times 8.7^2)^2} + \frac{450(-8 - 37.6 + 37.6^2)}{(64 + 16 \times 37.6 + 9 \times 37.6^2)^2} \right)^{48}$$

Result

$$3.0354078186632568216366107605966769350712011813380301580071... \times 10^{-69}$$

$$3.035407818... \cdot 10^{-69}$$

Now, we have:

$$\text{integrate}((((1+(1/2)^2(1-\beta) + ((1^3)/(2^4))^2(1-\beta)^2)))/(((1+(1/2)^2 \cdot \beta + ((1^3)/(2^4))^2 \beta^2))))$$

Indefinite integral

$$\int \frac{1 + \left(\frac{1}{2}\right)^2 (1 - \beta) + \left(\frac{3}{2 \times 4}\right)^2 (1 - \beta)^2}{1 + \left(\frac{1}{2}\right)^2 \beta + \left(\frac{3}{2 \times 4}\right)^2 \beta^2} d\beta =$$

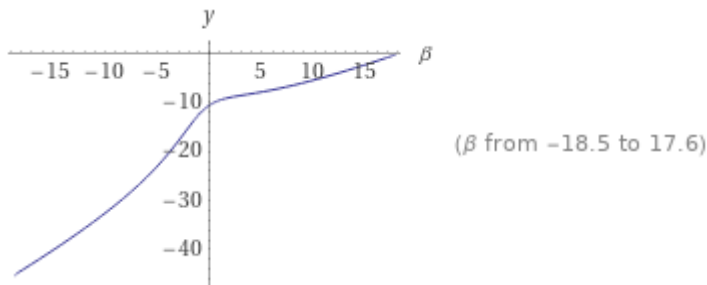
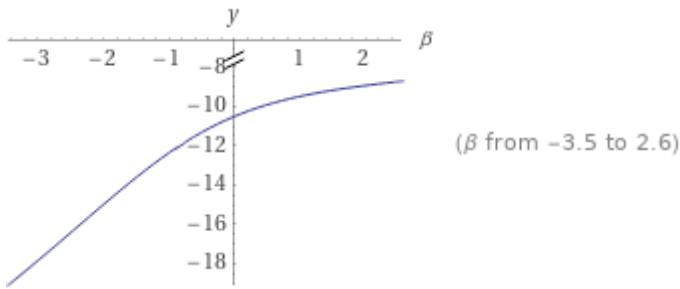
$$- \frac{25}{9} \log(9 \beta^2 + 16 \beta + 64) + \beta + \frac{625 \tan^{-1}\left(\frac{9\beta+8}{16\sqrt{2}}\right)}{144 \sqrt{2}} + \text{constant}$$

$\tan^{-1}(x)$ is the inverse tangent function

$\log(x)$ is the natural logarithm

Plots of the integral

(figure that can be related to the open strings)



Alternate forms of the integral

$$\beta - \frac{25}{9} \log(\beta(9\beta + 16) + 64) + \frac{625 \tan^{-1}\left(\frac{9\beta + 8}{16\sqrt{2}}\right)}{144\sqrt{2}} + \text{constant}$$

$$\frac{25}{288} \left(25\sqrt{2} \tan^{-1}\left(\frac{9\beta + 8}{16\sqrt{2}}\right) - 32 \log(9\beta^2 + 16\beta + 64) \right) + \beta + \text{constant}$$

$$\frac{1}{288} \left(-800 \log(9\beta^2 + 16\beta + 64) + 288\beta + 625\sqrt{2} \tan^{-1}\left(\frac{9\beta + 8}{16\sqrt{2}}\right) \right) + \text{constant}$$

Series expansion of the integral at $\beta=0$

$$\frac{25}{288} \left(25 \sqrt{2} \tan^{-1} \left(\frac{1}{2 \sqrt{2}} \right) - 192 \log(2) \right) + \frac{89 \beta}{64} - \frac{225 \beta^2}{512} + \frac{225 \beta^3}{4096} + O(\beta^4)$$

(Taylor series)

Series expansion of the integral at $\beta=1/9$ (-8-16 i sqrt(2))

$$\begin{aligned} & \left(\frac{1}{1152} \left(1250 i \sqrt{2} \log \left(\beta + \frac{1}{9} (8 + 16 i \sqrt{2}) \right) - \right. \right. \\ & \quad 3200 \log \left(-32 i \sqrt{2} \left(\beta + \frac{1}{9} (8 + 16 i \sqrt{2}) \right) \right) + 2500 i \sqrt{2} \log(3) - \\ & \quad \left. 6875 i \sqrt{2} \log(2) + 625 \sqrt{2} \pi - 2048 i \sqrt{2} - 1024 \right) + \\ & \quad \frac{(2673 - 800 i \sqrt{2}) \left(\beta - \frac{1}{9} (-8 - 16 i \sqrt{2}) \right)}{2048} - \\ & \quad \frac{225 i (-64 i + 25 \sqrt{2}) \left(\beta - \frac{1}{9} (-8 - 16 i \sqrt{2}) \right)^2}{262144} + \\ & \quad \frac{675 i (25 i + 32 \sqrt{2}) \left(\beta - \frac{1}{9} (-8 - 16 i \sqrt{2}) \right)^3}{4194304} + \\ & \quad \left. O \left(\left(\beta - \frac{1}{9} (-8 - 16 i \sqrt{2}) \right)^4 \right) \right) - \\ & \quad \frac{625 \pi \left[\frac{-\arg(9 \beta + 16 i \sqrt{2} + 8) - \arg \left(-\frac{9 \sqrt{2} \beta + 8 \sqrt{2} + 32 i}{-9 i \beta + 16 \sqrt{2} - 8 i} \right) + \pi}{2 \pi} \right]}{144 \sqrt{2}} \end{aligned}$$

Series expansion of the integral at $\beta=8/9$ $(-1+2 i \sqrt{2})$

$$\left(\frac{1}{1152} \left(-1250 i \sqrt{2} \log \left(\beta - \frac{8}{9} (-1 + 2 i \sqrt{2}) \right) - \right. \right. \\ \left. \left. 3200 \log \left(32 i \sqrt{2} \left(\beta - \frac{8}{9} (-1 + 2 i \sqrt{2}) \right) \right) - 2500 i \sqrt{2} \log(3) + \right. \right. \\ \left. \left. 6875 i \sqrt{2} \log(2) + 625 \sqrt{2} \pi + 2048 i \sqrt{2} - 1024 \right) + \right. \\ \left. \frac{(2673 + 800 i \sqrt{2}) \left(\beta - \frac{8}{9} (-1 + 2 i \sqrt{2}) \right)}{2048} + \right. \\ \left. \frac{225 i (64 i + 25 \sqrt{2}) \left(\beta - \frac{8}{9} (-1 + 2 i \sqrt{2}) \right)^2}{262144} - \right. \\ \left. \frac{675 i (-25 i + 32 \sqrt{2}) \left(\beta - \frac{8}{9} (-1 + 2 i \sqrt{2}) \right)^3}{4194304} + O \left(\left(\beta - \frac{8}{9} (-1 + 2 i \sqrt{2}) \right)^4 \right) \right) + \\ \frac{625 \pi \left[\frac{-\arg(9 \beta - 16 i \sqrt{2} + 8) - \arg \left(-\frac{9 \sqrt{2} \beta + 8 \sqrt{2} - 32 i}{9 i \beta + 16 \sqrt{2} + 8 i} \right) + \pi}{2 \pi} \right]}{144 \sqrt{2}}$$

From:

$$\beta - \frac{25}{9} \log(\beta (9 \beta + 16) + 64) + \frac{625 \tan^{-1} \left(\frac{9 \beta + 8}{16 \sqrt{2}} \right)}{144 \sqrt{2}} + \text{constant}$$

For $\beta = 2.6$ and 17.6 :

$$2.6 - \frac{25}{9} \ln(2.6(9 \times 2.6 + 16) + 64) + 1/(144 \times \sqrt{2}) \times (((625 \times \tan^{-1}((9 \times 2.6 + 8)/(16 \sqrt{2}))))))$$

Input

$$2.6 - \frac{25}{9} \log(2.6 (9 \times 2.6 + 16) + 64) + \frac{1}{144 \sqrt{2}} \left(625 \tan^{-1} \left(\frac{9 \times 2.6 + 8}{16 \sqrt{2}} \right) \right)$$

$\log(x)$ is the natural logarithm

$\tan^{-1}(x)$ is the inverse tangent function

Result

-8.702883732160629474410401691473179346546437596824331296591774528

...

(result in radians)

-8.70288373216....

And:

$$17.6 - \frac{25}{9} \ln(17.6(9 \times 17.6 + 16) + 64) + \frac{1}{144 \sqrt{2}} \left(625 \tan^{-1} \left(\frac{9 \times 17.6 + 8}{16 \sqrt{2}} \right) \right)$$

Input

$$17.6 - \frac{25}{9} \log(17.6(9 \times 17.6 + 16) + 64) + \frac{1}{144 \sqrt{2}} \left(625 \tan^{-1} \left(\frac{9 \times 17.6 + 8}{16 \sqrt{2}} \right) \right)$$

$\log(x)$ is the natural logarithm

$\tan^{-1}(x)$ is the inverse tangent function

Result

-0.354750169164396845468823426569036408394987154482778195166303746

...

(result in radians)

-0.35475016916....

From the two previous analyzed expressions:

$$\left(\frac{450(-8 - 8.7 + 8.7^2)}{(64 + 16 \times 8.7 + 9 \times 8.7^2)^2} + \frac{450(-8 - 37.6 + 37.6^2)}{(64 + 16 \times 37.6 + 9 \times 37.6^2)^2} \right)^{48}$$

Input

$$\left(\frac{450(-8 - 8.7 + 8.7^2)}{(64 + 16 \times 8.7 + 9 \times 8.7^2)^2} + \frac{450(-8 - 37.6 + 37.6^2)}{(64 + 16 \times 37.6 + 9 \times 37.6^2)^2} \right)^{48}$$

Result

3.0354078186632568216366107605966769350712011813380301580071... $\times 10^{-69}$

3.035407818... $\times 10^{-69}$

And:

$$\frac{1}{\left(\left(2.6 - \frac{25}{9} \ln(2.6(9 \times 2.6 + 16) + 64) + \frac{1}{144\sqrt{2}} \left(625 \tan^{-1} \left(\frac{9 \times 2.6 + 8}{16\sqrt{2}} \right) \right) \right) + \left(17.6 - \frac{25}{9} \ln(17.6(9 \times 17.6 + 16) + 64) + \frac{1}{144\sqrt{2}} \left(625 \tan^{-1} \left(\frac{9 \times 17.6 + 8}{16\sqrt{2}} \right) \right) \right) \right)^{72}}$$

Input

$$\frac{1}{\left(\left(2.6 - \frac{25}{9} \log(2.6(9 \times 2.6 + 16) + 64) + \frac{1}{144\sqrt{2}} \left(625 \tan^{-1} \left(\frac{9 \times 2.6 + 8}{16\sqrt{2}} \right) \right) \right) + \left(17.6 - \frac{25}{9} \log(17.6(9 \times 17.6 + 16) + 64) + \frac{1}{144\sqrt{2}} \left(625 \tan^{-1} \left(\frac{9 \times 17.6 + 8}{16\sqrt{2}} \right) \right) \right) \right)^{72}}$$

$\log(x)$ is the natural logarithm

$\tan^{-1}(x)$ is the inverse tangent function

Result

1.24433... $\times 10^{-69}$

(result in radians)

1.24433... $\times 10^{-69}$

we obtain, after some calculations:

$$\frac{(16 \sqrt{2/3} \log^{(3/2)}(2)) / (e^{(5/2)} \log^2(3))}{((1/(1+(\zeta(2))^2)(3.035407 \times 10^{-69} + 1.24433 \times 10^{-69}) + 1.24433 \times 10^{-69}))}$$

where

$$\frac{16 \sqrt{\frac{2}{3}} \log^{3/2}(2)}{e^{5/2} \log^2(3)}$$

$$= 0.5127284721865.....$$

Input interpretation

$$\frac{16 \sqrt{\frac{2}{3}} \log^{3/2}(2)}{e^{5/2} \log^2(3)} \left(\frac{1}{1 + \zeta(2)^2} (3.035407 \times 10^{-69} + 1.24433 \times 10^{-69}) + 1.24433 \times 10^{-69} \right)$$

$\log(x)$ is the natural logarithm

$\zeta(s)$ is the Riemann zeta function

Result

$$1.23014... \times 10^{-69}$$

$$1.23014... * 10^{-69}$$

Or:

$$\begin{aligned} & (\sqrt{\frac{((\sqrt{10-2\sqrt{5}}-2)(\sqrt{5}-1)))^{\pi/(2+\sqrt{3}/2)} + 0.011303146014}}{((1/(1+(\zeta(2))^2)(3.035407 \times 10^{-69} + 1.24433 \times 10^{-69}) + 1.24433 \times 10^{-69}))} \end{aligned}$$

$$\text{where } (((\sqrt{10-2\sqrt{5}}-2)(\sqrt{5}-1))) = \kappa = 8\pi G ; \quad G = 0.011303146014$$

$$\begin{aligned} & (\sqrt{\frac{((\sqrt{10-2\sqrt{5}}-2)(\sqrt{5}-1)))^{\pi/(2+\sqrt{3}/2)} + 0.011303146014}}{((1/(1+(\zeta(2))^2)(3.035407 \times 10^{-69} + 1.24433 \times 10^{-69}) + 1.24433 \times 10^{-69}))} \end{aligned}$$

Input interpretation

$$\sqrt{\left(\left(\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)^{\pi/\left(2+\frac{\sqrt{3}}{2}\right)} + 0.011303146014\right) \left(\frac{1}{1+\zeta(2)^2} (3.035407 \times 10^{-69} + 1.24433 \times 10^{-69}) + 1.24433 \times 10^{-69}\right)}$$

$\zeta(s)$ is the Riemann zeta function

Result

$$1.23041... \times 10^{-69}$$

$$1.23041... * 10^{-69}$$

result that is almost equal to the mass m obtained from the Einstein equation inserting the data $E = 1.1056 * 10^{-52}$ (Λ = Dark Energy) and $c = 299792458$

We note that, performing the square root of the above expression, after some calculations, we obtain:

$$((e - \log(8))/\log(4)) * \sqrt{\left(\left(\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)^{\pi/(2+\sqrt{3}/2)} + 0.011303146014\right) \left(\frac{1}{1+(\zeta(2))^2} (3.035407 * 10^{-69} + 1.24433 \times 10^{-69}) + 1.24433 \times 10^{-69}\right)}$$

where

$$\frac{e - \log(8)}{\log(4)} \approx 0.4608258568$$

Input interpretation

$$\frac{e - \log(8)}{\log(4)} \sqrt{\left(\left(\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)^{\pi/\left(2+\frac{\sqrt{3}}{2}\right)} + 0.011303146014\right) \left(\frac{1}{1+\zeta(2)^2} (3.035407 \times 10^{-69} + 1.24433 \times 10^{-69}) + 1.24433 \times 10^{-69}\right)}$$

$\log(x)$ is the natural logarithm

$\zeta(s)$ is the Riemann zeta function

Result

$$1.61645... \times 10^{-35}$$

$1.61645... \times 10^{-35}$ result almost equal to the value of the Planck length 1.616255×10^{-35} m

It is possible that can to exist a light particle (possible Dark Matter candidate) having a mass $\approx 10^{-69}$?

We have also:

$$\frac{1}{3\phi + 0.8} (1.1056 \times 10^{-52}) \times \frac{1}{((\sqrt{5} + \sqrt{3}) [1 + 2e^{(-1/3 \cdot \pi \cdot \sqrt{5})} + 2e^{(-1/3 \cdot 4\pi \cdot \sqrt{5})} + 2e^{(-1/3 \cdot 9\pi \cdot \sqrt{5})}])^{24}}$$

Input interpretation

$$\frac{1}{3\phi + 0.8} \times 1.1056 \times 10^{-52} \times \frac{1}{((\sqrt{5} + \sqrt{3}) (1 + 2e^{-(\pi \sqrt{5})/3} + 2e^{-1/3 \times 4(\pi \sqrt{5})} + 2e^{-1/3 \times 9(\pi \sqrt{5})}))^{24}}$$

ϕ is the golden ratio

Result

$$1.23041... \times 10^{-69}$$

$$1.23041... \times 10^{-69}$$

Or:

$$\frac{(e^{(-2/3 + 2/(3e) - (2e)/3 + 1/\pi + \pi)} \pi^{(2/3 - (4e)/3)}) / (\sin^{(5/3)}(e\pi)) (1.1056 \times 10^{-52})}{((\sqrt{5} + \sqrt{3}) [1 + 2e^{(-1/3 \cdot \pi \cdot \sqrt{5})} + 2e^{(-1/3 \cdot 4\pi \cdot \sqrt{5})} + 2e^{(-1/3 \cdot 9\pi \cdot \sqrt{5})}])^{24}}$$

where

$$\frac{e^{-2/3 + 2/(3e) - (2e)/3 + 1/\pi + \pi} \pi^{2/3 - (4e)/3}}{\sin^{5/3}(e\pi)} \approx 0.1768627459520$$

Input interpretation

$$\frac{e^{-\frac{2}{3} + \frac{2}{3e} - \frac{2e}{3} + \frac{1}{\pi} + \pi} \pi^{2/3 - (4e)/3}}{\sin^{5/3}(e\pi)} \times 1.1056 \times 10^{-52} \times \frac{1}{\left((\sqrt{5} + \sqrt{3}) \left(1 + 2e^{-(\pi\sqrt{5})/3} + 2e^{-1/3 \times 4(\pi\sqrt{5})} + 2e^{-1/3 \times 9(\pi\sqrt{5})}\right)\right)^{24}}$$

Result

$$1.23041... \times 10^{-69}$$

$$1.23041... * 10^{-69}$$

And considering the photon mass equal to $1.5 * 10^{-71}$ kg , we have also:

$$1.5 \times 10^{-71} * 1 / (\ln(196884) * 1/10^3)$$

Input interpretation

$$1.5 \times 10^{-71} \times \frac{1}{\log(196884) \times \frac{1}{10^3}}$$

$\log(x)$ is the natural logarithm

Result

$$1.23048... \times 10^{-69}$$

$$1.23048... * 10^{-69}$$

Or:

$$1.23048 * 10^{-69} * 1 / ((1 / (\ln(196884) * 1/10^3)))$$

Input interpretation

$$1.23048 \times 10^{-69} \times \frac{1}{\frac{1}{\log(196884) \times \frac{1}{10^3}}}$$

$\log(x)$ is the natural logarithm

Result

$$1.50000... \times 10^{-71}$$

$$1.5 \times 10^{-71}$$

That in GeV is:

$$((1.5 \times 10^{-71} \times 1 / (\ln(196884) \times 1 / 10^3))) \text{ Kg} = \text{GeV}/c^2$$

Input interpretation

$$\text{convert } 1.5 \times 10^{-71} \times \frac{1}{\log(196884) \times \frac{1}{10^3}} \text{ kg (kilograms)}$$

to gigaelectronvolts per speed of light squared

Result

$$6.902 \times 10^{-43} \text{ GeV}/c^2$$

$$6.902 \times 10^{-43}$$

Indeed:

$$1.23048 \times 10^{-69} \text{ Kg} = \text{GeV}$$

Input interpretation

$$\text{convert } 1.23048 \times 10^{-69} \text{ kg (kilograms)}$$

to gigaelectronvolts per speed of light squared

Result

$$6.9025 \times 10^{-43} \text{ GeV}/c^2$$

$$6.9025 \times 10^{-43}$$

And also:

$$(1.1056 \times 10^{-52}) / (8\pi \times 6.67408 \times 10^{-11})$$

Input interpretation

$$\frac{1.1056 \times 10^{-52}}{8\pi \times 6.67408 \times 10^{-11}}$$

Result

$$6.59123... \times 10^{-44}$$

$$6.59123... * 10^{-44}$$

Dividing the two above expressions:

$$(6.9025 \times 10^{-43}) / ((1.1056 \times 10^{-52}) / (8\pi \times 6.67408 \times 10^{-11}))$$

Input interpretation

$$\frac{6.9025 \times 10^{-43}}{1.1056 \times 10^{-52} \times \frac{1}{8\pi \times 6.67408 \times 10^{-11}}}$$

Result

$$10.4722...$$

$$10.4722....$$

From which:

$$(((6.9025 \times 10^{-43}) / ((1.1056 \times 10^{-52}) / (8\pi \times 6.67408 \times 10^{-11}))))^{1/(4 + \sqrt{2}/2)}$$

Input interpretation

$$4 + \frac{\sqrt{2}}{2} \sqrt{\frac{6.9025 \times 10^{-43}}{1.1056 \times 10^{-52} \times \frac{1}{8\pi \times 6.67408 \times 10^{-11}}}}$$

Result

1.6470320198861921826350667365854494107382494241340191832919927268

...

1.6470320198... $\approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 \dots$ (trace of the instanton shape)

We note that:

$$1.23041 \times 10^{-69} \text{ Kg} = \text{GeV}$$

Input interpretation

convert $1.23041 \times 10^{-69} \text{ kg}$ (kilograms)
to gigaelectronvolts per speed of light squared

Result

$$6.9021 \times 10^{-43} \text{ GeV}/c^2$$
$$6.9021 \times 10^{-43}$$

Dividing as before:

$$(6.9021 \times 10^{-43}) / ((1.1056 \times 10^{-52}) / (8\pi \times 6.67408 \times 10^{-11}))$$

Input interpretation

$$\frac{6.9021 \times 10^{-43}}{1.1056 \times 10^{-52} \times \frac{1}{8\pi \times 6.67408 \times 10^{-11}}}$$

Result

10.4716...

10.4716....

From which:

$$16(((6.9021 \times 10^{-43}) / ((1.1056 \times 10^{-52}) / (8\pi \times 6.67408 \times 10^{-11}))))^{2-29+3+\Phi}$$

Input interpretation

$$16 \left(\frac{6.9021 \times 10^{-43}}{1.1056 \times 10^{-52} \times \frac{1}{8\pi \times 6.67408 \times 10^{-11}}} \right)^2 - 29 + 3 + \Phi$$

Φ is the golden ratio conjugate

Result

1729.10...

1729.10....

This result is very near to the mass of candidate glueball **$f_0(1710)$ scalar meson**. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. ($1728 = 8^2 * 3^3$) The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

$$[(16(((6.9021 \times 10^{-43}) / ((1.1056 \times 10^{-52}) / (8\pi \times 6.67408 \times 10^{-11}))))^{2-29+3+\Phi} - 1)]^{1/15}$$

Input interpretation

$$\sqrt[15]{16 \left(\frac{6.9021 \times 10^{-43}}{1.1056 \times 10^{-52} \times \frac{1}{8\pi \times 6.67408 \times 10^{-11}}} \right)^2 - 29 + 3 + \Phi} - 1$$

Φ is the golden ratio conjugate

Result

1.64376...

$1.64376... \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 \dots$ (trace of the instanton shape)

$$(1/27[(16(((6.9021 \times 10^{-43}) / ((1.1056 \times 10^{-52}) / (8\pi \times 6.67408 \times 10^{-11}))))^{2-29+3+\Phi} - 1)]^{1/15} - ((\sqrt{(10-2\sqrt{5})} - 2) / (\sqrt{5} - 1)))^{0.5}$$

Input interpretation

$$\left(\frac{1}{27} \left(\left(16 \left(\frac{6.9021 \times 10^{-43}}{1.1056 \times 10^{-52} \times \frac{1}{8\pi \times 6.67408 \times 10^{-11}}} \right)^2 - 29 + 3 + \Phi \right) - 1 \right) \right)^2 - \sqrt{\frac{\sqrt{10 - 2\sqrt{5}} - 2}{\sqrt{5} - 1}}$$

Φ is the golden ratio conjugate

Result

4095.94...

4095.94.... $\approx 4096 = 64^2$

Now, from the following data, after some calculations, we obtain:

((Energy vacuum density * Planck density) / speed of light squared * Planck entropy in 2π)) * inverse mass of a single soliton

((((1.82567*10⁻¹²¹*3.264346*10⁹⁴)/299792458² * 2.197371*10⁻²⁴))*1/118.18111336

Input interpretation

$$\left(\frac{\frac{1.82567}{10^{121}} \times 3.264346 \times 10^{94}}{299792458^2} \times 2.197371 \times 10^{-24} \right) \times \frac{1}{118.18111336}$$

Result

1.2329128237931945824709995675847620164173243383024797691104... $\times 10^{-69}$

1.232912823... $\times 10^{-69}$

From:

Manuscript Book 1 – Srinivasa Ramanujan

We have that

$$(\sqrt{5} + \sqrt{3}) \left\{ 1 + 2e^{-\frac{\pi\sqrt{5}}{3}} + 2e^{-\frac{4\pi\sqrt{5}}{3}} + 2e^{-\frac{9\pi\sqrt{5}}{3}} \right\}$$

$$= (3 + \sqrt{3}) \left\{ 1 + 2e^{-3\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right\}$$

$$(\sqrt{5} + \sqrt{3}) [1 + 2e^{(-1/3 \cdot \pi \cdot \sqrt{5})} + 2e^{(-1/3 \cdot 4\pi \cdot \sqrt{5})} + 2e^{(-1/3 \cdot 9\pi \cdot \sqrt{5})}]$$

Input

$$(\sqrt{5} + \sqrt{3}) \left(1 + 2e^{-(\pi\sqrt{5})/3} + 2e^{-1/3 \times 4(\pi\sqrt{5})} + 2e^{-1/3 \times 9(\pi\sqrt{5})} \right)$$

Exact result

$$(\sqrt{3} + \sqrt{5}) \left(1 + 2e^{-3\sqrt{5}\pi} + 2e^{-(4\sqrt{5}\pi)/3} + 2e^{-(\sqrt{5}\pi)/3} \right)$$

Decimal approximation

4.7320508142302624451212874346583002327722603647641713992087439108

...

4.73205081423....

Alternate forms

$$(\sqrt{3} + \sqrt{5}) \left(1 + 2e^{-3\sqrt{5}\pi} \left(1 + e^{(5\sqrt{5}\pi)/3} + e^{(8\sqrt{5}\pi)/3} \right) \right)$$

$$(\sqrt{3} + \sqrt{5}) e^{-3\sqrt{5}\pi} \left(2 + 2e^{(5\sqrt{5}\pi)/3} + 2e^{(8\sqrt{5}\pi)/3} + e^{3\sqrt{5}\pi} \right)$$

$$\sqrt{3} + \sqrt{5} + 2(\sqrt{3} + \sqrt{5}) e^{-3\sqrt{5}\pi} + 2(\sqrt{3} + \sqrt{5}) e^{-(4\sqrt{5}\pi)/3} + 2(\sqrt{3} + \sqrt{5}) e^{-(\sqrt{5}\pi)/3}$$

Expanded form

$$\sqrt{3} + \sqrt{5} + 2\sqrt{3} e^{-3\sqrt{5}\pi} + 2\sqrt{5} e^{-3\sqrt{5}\pi} + 2\sqrt{3} e^{-(4\sqrt{5}\pi)/3} + 2\sqrt{5} e^{-(4\sqrt{5}\pi)/3} + 2\sqrt{3} e^{-(\sqrt{5}\pi)/3} + 2\sqrt{5} e^{-(\sqrt{5}\pi)/3}$$

Series representations

$$\begin{aligned} & (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{1/3(\pi\sqrt{5})(-1)} + 2e^{1/3(4(\pi\sqrt{5}))(-1)} + 2e^{1/3(9(\pi\sqrt{5}))(-1)} \right) = \\ & e^{-3\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \\ & \left(2 + 2e^{5/3\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} + 2e^{8/3\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} + e^{3\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \right) \\ & \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} (2^k \sqrt{2} + \sqrt{4}) \end{aligned}$$

$$\begin{aligned} & (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{1/3(\pi\sqrt{5})(-1)} + 2e^{1/3(4(\pi\sqrt{5}))(-1)} + 2e^{1/3(9(\pi\sqrt{5}))(-1)} \right) = \\ & \exp \left(-3\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \\ & \left(2 + 2 \exp \left(\frac{5}{3}\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) + 2 \exp \left(\frac{8}{3}\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) + \right. \\ & \left. \exp \left(3\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \right) \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)_k \left(\left(-\frac{1}{2}\right)^k \sqrt{2} + \left(-\frac{1}{4}\right)^k \sqrt{4}\right)}{k!} \end{aligned}$$

$$\begin{aligned}
& (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{\frac{1}{3}(\pi\sqrt{5})(-1)} + 2e^{\frac{1}{3}(4(\pi\sqrt{5}))(-1)} + 2e^{\frac{1}{3}(9(\pi\sqrt{5}))(-1)} \right) = \\
& \exp\left(-3\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!}\right) \\
& \left(2 + 2\exp\left(\frac{5}{3}\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!}\right) + \right. \\
& \quad \left. 2\exp\left(\frac{8}{3}\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!}\right) + \right. \\
& \quad \left. \exp\left(3\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!}\right) \right) \\
& \quad \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k ((3-z_0)^k + (5-z_0)^k) z_0^{-k}}{k!} \\
& \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))
\end{aligned}$$

$$(3+\sqrt{3}) [1+2e^{(-2\pi i \sqrt{5})}+2e^{(-12\pi i \sqrt{5})}+2e^{(-27\pi i \sqrt{5})}]$$

Input

$$(3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right)$$

Decimal approximation

4.7320582962070344203358871508574881888314709819745983166753686081
...

4.7320582962....

Alternate forms

$$(3 + \sqrt{3}) \left(1 + 2e^{-27\sqrt{5}\pi} \left(1 + e^{15\sqrt{5}\pi} + e^{25\sqrt{5}\pi} \right) \right)$$

$$(3 + \sqrt{3}) e^{-27\sqrt{5}\pi} (2 + 2e^{15\sqrt{5}\pi} + 2e^{25\sqrt{5}\pi} + e^{27\sqrt{5}\pi})$$

$$3 + \sqrt{3} + 2(3 + \sqrt{3}) e^{-27\sqrt{5}\pi} + 2(3 + \sqrt{3}) e^{-12\sqrt{5}\pi} + 2(3 + \sqrt{3}) e^{-2\sqrt{5}\pi}$$

Expanded form

$$3 + \sqrt{3} + 6e^{-27\sqrt{5}\pi} + 2\sqrt{3}e^{-27\sqrt{5}\pi} + 6e^{-12\sqrt{5}\pi} + 2\sqrt{3}e^{-12\sqrt{5}\pi} + 6e^{-2\sqrt{5}\pi} + 2\sqrt{3}e^{-2\sqrt{5}\pi}$$

Series representations

$$(3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right) = e^{-27\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \left(2 + 2e^{15\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} + 2e^{25\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} + e^{27\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \right) \left(3 + \sqrt{2} \sum_{k=0}^{\infty} 2^{-k} \binom{\frac{1}{2}}{k} \right)$$

$$(3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right) = \exp \left(-27\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \left(2 + 2 \exp \left(15\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) + 2 \exp \left(25\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) + \exp \left(27\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \right) \left(3 + \sqrt{2} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right)$$

$$\begin{aligned}
& (3 + \sqrt{3}) \left(1 + 2 e^{-2\pi\sqrt{5}} + 2 e^{-12\pi\sqrt{5}} + 2 e^{-27\pi\sqrt{5}} \right) = \\
& \exp \left(-27\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \right) \\
& \left(2 + 2 \exp \left(15\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \right) + \right. \\
& \left. 2 \exp \left(25\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \right) + \right. \\
& \left. \exp \left(27\pi\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \right) \right) \\
& \left(3 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (3-z_0)^k z_0^{-k}}{k!} \right) \text{ for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))
\end{aligned}$$

From:

Majorana Fermion Dark Matter in Minimally Extended Left-Right Symmetric Model - *M. J. Neves, Nobuchika Okada and Satomi Okada* - arXiv:2103.08873v1 [hep-ph] 16 Mar 2021

We have:

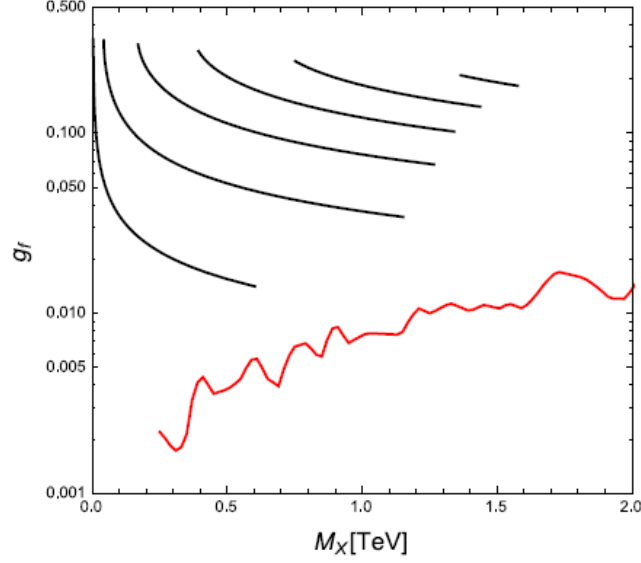


FIG. 6. The plot of M_X versus g_f for the annihilation process (ii) $\bar{\zeta}_\ell \zeta_\ell \rightarrow X X$. The black solid curves from left to right depict the results for $a = 0.3, 1, 2, 3, 4$ and 5 , respectively, from left to right, along which $\Omega_{DM} h^2 = 0.12$ is satisfied. The diagonal red line shows the upper bound on g_f as a function of $M_X \geq 0.25$ TeV from the LHC Run-2 results. No allowed region exists for $M_X \geq 0.25$ TeV, which can simultaneously satisfy the cosmological and LHC constraints.

Combining the results with the perturbative condition and the LHC Run-2 constraints, we have found the allowed parameter region to be very narrow. As for the process (ii), we have found that the parameter region (g_f as a function of M_X) satisfying the cosmological constraint appears far above the upper bound on g_f (for $M_X \geq 0.25$ TeV), and no allowed parameter region exists.

Now, we consider the possible mass of a DM particle equal to 250 GeV. We obtain:

$$250 \text{ GeV} = \text{Kg}$$

Input interpretation

convert $250 \text{ GeV}/c^2$ to kilograms

Result

$$4.457 \times 10^{-25} \text{ kg (kilograms)}$$

$$4.457 * 10^{-25} \text{ kg}$$

Now we consider the following value

$$\omega/\omega_3 \mid 5+3 \mid m_{u/d} = 240-345 \mid 0.937-1.000$$

i.e. 0.937 and we perform the following mean:

$$0.937 + 0.9568666373 / 2 = 0.94693331865$$

where 0.9568666373 is the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}} - \varphi + 1} = 1 - \frac{e^{-\pi}}{1 + \frac{e^{-2\pi}}{1 + \frac{e^{-3\pi}}{1 + \frac{e^{-4\pi}}{1 + \dots}}}} \approx 0.9568666373$$

From the previous expressions, after some calculations, we obtain:

$$((((3+\sqrt{3}) [1+2e^{(-2\pi*\sqrt{5})}+2e^{(-12\pi*\sqrt{5})}+2e^{(-27\pi*\sqrt{5})}] + (\sqrt{5}+\sqrt{3}) [1+2e^{(-1/3*\pi*\sqrt{5})}+2e^{(-1/3*4\pi*\sqrt{5})}+2e^{(-1/3*9\pi*\sqrt{5})}]])))*2*0.94693$$

Input

$$\left((3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right) + (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{-(\pi\sqrt{5})/3} + 2e^{-1/3 \times 4(\pi\sqrt{5})} + 2e^{-1/3 \times 9(\pi\sqrt{5})} \right) \right) \times 2 \times 0.94693$$

Result

17.9237...

17.9237

Series representations

$$\begin{aligned}
& \left((3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right) + \right. \\
& \quad \left. (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{1/3(\pi\sqrt{5})(-1)} + 2e^{1/3(4(\pi\sqrt{5}))(-1)} + 2e^{1/3(9(\pi\sqrt{5}))(-1)} \right) \right) \\
& 2 \times 0.94693 = 1.89386 e^{-27\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \\
& \left(6 + 6e^{15\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} + 6e^{25\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} + 3e^{27\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} + \right. \\
& \quad 2\sqrt{2} \sum_{k=0}^{\infty} 2^{-k} \binom{\frac{1}{2}}{k} + 2e^{15\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \sqrt{2} \sum_{k=0}^{\infty} 2^{-k} \binom{\frac{1}{2}}{k} + \\
& \quad 2e^{25\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \sqrt{2} \sum_{k=0}^{\infty} 2^{-k} \binom{\frac{1}{2}}{k} + e^{27\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \sqrt{2} \\
& \quad \sum_{k=0}^{\infty} 2^{-k} \binom{\frac{1}{2}}{k} + 2e^{24\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} (2^k \sqrt{2} + \sqrt{4}) + \\
& \quad 2e^{77/3\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} (2^k \sqrt{2} + \sqrt{4}) + \\
& \quad 2e^{80/3\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} (2^k \sqrt{2} + \sqrt{4}) + \\
& \quad \left. e^{27\pi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{1/2}{k}} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} (2^k \sqrt{2} + \sqrt{4}) \right)
\end{aligned}$$

$$\begin{aligned}
& \left((3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right) + \right. \\
& \quad \left. (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{1/3(\pi\sqrt{5})(-1)} + 2e^{1/3(4(\pi\sqrt{5}))(-1)} + 2e^{1/3(9(\pi\sqrt{5}))(-1)} \right) \right) \\
& 2 \times 0.94693 = 1.89386 \exp \left(-27\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \\
& \left(6 + 6 \exp \left(15\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) + 6 \exp \left(25\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) + \right. \\
& \quad 3 \exp \left(27\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) + 2\sqrt{2} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \\
& \quad 2 \exp \left(15\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sqrt{2} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \\
& \quad 2 \exp \left(25\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sqrt{2} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \\
& \quad \exp \left(27\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sqrt{2} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \\
& \quad 2 \exp \left(24\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)_k \left(\left(-\frac{1}{2}\right)^k \sqrt{2} + \left(-\frac{1}{4}\right)^k \sqrt{4} \right)}{k!} + \\
& \quad 2 \exp \left(\frac{77}{3}\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)_k \left(\left(-\frac{1}{2}\right)^k \sqrt{2} + \left(-\frac{1}{4}\right)^k \sqrt{4} \right)}{k!} + \\
& \quad 2 \exp \left(\frac{80}{3}\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)_k \left(\left(-\frac{1}{2}\right)^k \sqrt{2} + \left(-\frac{1}{4}\right)^k \sqrt{4} \right)}{k!} + \\
& \quad \left. \exp \left(27\pi\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)_k \left(\left(-\frac{1}{2}\right)^k \sqrt{2} + \left(-\frac{1}{4}\right)^k \sqrt{4} \right)}{k!} \right)
\end{aligned}$$

$$\begin{aligned}
& \left((3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right) + \right. \\
& \quad \left. (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{1/3(\pi\sqrt{5})(-1)} + 2e^{1/3(4(\pi\sqrt{5}))(-1)} + 2e^{1/3(9(\pi\sqrt{5}))(-1)} \right) \right) \\
& 2 \times 0.94693 = 1.89386 e^{-27\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \\
& \left(6 + 6e^{15\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} + 6e^{25\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} + \right. \\
& 3e^{27\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} + 2e^{24\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \\
& \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left((3-z_0)^k + (5-z_0)^k \right) z_0^{-k}}{k!} + \\
& 2e^{\frac{77}{3}\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \sqrt{z_0} \\
& \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left((3-z_0)^k + (5-z_0)^k \right) z_0^{-k}}{k!} + \\
& 2e^{\frac{80}{3}\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \sqrt{z_0} \\
& \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left((3-z_0)^k + (5-z_0)^k \right) z_0^{-k}}{k!} + \\
& e^{27\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \sqrt{z_0} \\
& \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left((3-z_0)^k + (5-z_0)^k \right) z_0^{-k}}{k!} + \\
& 2\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (3-z_0)^k z_0^{-k}}{k!} + \\
& 2e^{15\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (3-z_0)^k z_0^{-k}}{k!} + \\
& 2e^{25\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (3-z_0)^k z_0^{-k}}{k!} + \\
& \left. e^{27\pi\sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5-z_0)^k z_0^{-k}}{k!} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (3-z_0)^k z_0^{-k}}{k!} \right)
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

From:

$$1/((1.23041 \times 10^{-69}) \times 3.264346 \times 10^{94}) ((((((3 + \sqrt{3}) [1 + 2e^{(-2\pi \sqrt{5})} + 2e^{(-12\pi \sqrt{5})} + 2e^{(-27\pi \sqrt{5})}] + (\sqrt{5} + \sqrt{3}) [1 + 2e^{(-1/3 \pi \sqrt{5})} + 2e^{(-1/3 \times 4\pi \sqrt{5})} + 2e^{(-1/3 \times 9\pi \sqrt{5})}])))) \times 2 \times 0.94693)))$$

where 1.23041×10^{-69} is the result that we have obtained previously and 3.264346×10^{94} is the value of the Planck Density. Multiplying the two values and the above expression, we obtain:

Input interpretation

$$\frac{1}{1.23041 \times 10^{-69} \times 3.264346 \times 10^{94} \left(\left((3 + \sqrt{3}) \left(1 + 2e^{-2\pi \sqrt{5}} + 2e^{-12\pi \sqrt{5}} + 2e^{-27\pi \sqrt{5}} \right) + (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{-(\pi \sqrt{5})/3} + 2e^{-1/3 \times 4\pi \sqrt{5}} + 2e^{-1/3 \times 9\pi \sqrt{5}} \right) \right) \times 2 \times 0.94693 \right)}$$

Result

$$4.46253... \times 10^{-25}$$

$4.46253... \times 10^{-25}$ result that is very near to the value of the possible mass of a DM particle equal to $250 \text{ GeV} = 4.457 \times 10^{-25} \text{ kg}$

Now, we calculate the expression of the [Planck Density](#):

$$\rho_P = \frac{m_P}{l_P^3} = \frac{\hbar t_P}{l_P^5} = \frac{c^5}{16\pi^2 \hbar G^2}$$

we obtain:

$$299792458^5 / (16\pi^2 \times 1.054571817 \times 10^{-34} \times (6.67430 \times 10^{-11})^2)$$

Input interpretation

$$\frac{299792458^5}{16\pi^2 \times 1.054571817 \times 10^{-34} (6.67430 \times 10^{-11})^2}$$

Result

$$3.26434595103581395825686449204582556680280301452137907076801... \times 10^{94}$$

$$3.26434595103... \times 10^{94}$$

From the previous expression, we have:

$$1/((1.23041e-69)*(299792458^5 / (16\pi^2*1.054571817e-34 * (6.67430e-11)^2)))$$

Input interpretation

$$\frac{1}{1.23041 \times 10^{-69} \times \frac{299792458^5}{16\pi^2 \times 1.054571817 \times 10^{-34} (6.67430 \times 10^{-11})^2}}$$

Result

$$2.48974... \times 10^{-26}$$

$$2.48974... * 10^{-26}$$

$$2.48974 * 10^{-26} * (((((3 + \sqrt{3}) [1 + 2e^{(-2\pi\sqrt{5})} + 2e^{(-12\pi\sqrt{5})} + 2e^{(-27\pi\sqrt{5})}] + (\sqrt{5} + \sqrt{3}) [1 + 2e^{(-1/3*\pi\sqrt{5})} + 2e^{(-1/3*4\pi\sqrt{5})} + 2e^{(-1/3*9\pi\sqrt{5})}])))) * 2 * 0.94693)$$

Input interpretation

$$2.48974 \times 10^{-26} \left(\left((3 + \sqrt{3}) \left(1 + 2e^{-2\pi\sqrt{5}} + 2e^{-12\pi\sqrt{5}} + 2e^{-27\pi\sqrt{5}} \right) + (\sqrt{5} + \sqrt{3}) \left(1 + 2e^{-(\pi\sqrt{5})/3} + 2e^{-1/3 \times 4\pi\sqrt{5}} + 2e^{-1/3 \times 9\pi\sqrt{5}} \right) \right) \right) \times 2 \times 0.94693$$

Result

$$4.46253... \times 10^{-25}$$

$$4.46253... * 10^{-25} \text{ that is very near to the value of the possible mass of a DM particle equal to } 250 \text{ GeV} = 4.457 \times 10^{-25} \text{ kg}$$

Coefficients of the 3rd order mock theta function f(q).

(From:

<https://oeis.org/search?q=+mock+theta+functions&sort=&language=&go=Search>)

We have:

$$n = 39 ; a(n) = 245 ; \quad n = 40 ; a(n) = -262$$

From the following Ramanujan formula

$$a_f(n) \sim \frac{(-1)^{n-1}}{2\sqrt{n - \frac{1}{24}}} \cdot e^{\pi\sqrt{\frac{n}{6} - \frac{1}{144}}}.$$

For $n = 39$, we obtain:

$$((-1)^{38}) / ((2*\sqrt{39-1/24})) * e^{(\pi*\sqrt{39/6-1/144})}$$

Input

$$\frac{(-1)^{38}}{2\sqrt{39 - \frac{1}{24}}} e^{\pi\sqrt{39/6 - 1/144}}$$

Exact result

$$\sqrt{\frac{6}{935}} e^{(\sqrt{935} \pi)/12}$$

Decimal approximation

240.05014966161232342264860076175711407712122471865790100074676463

...

240.0501496....

Property

$$\sqrt{\frac{6}{935}} e^{(\sqrt{935} \pi)/12} \text{ is a transcendental number}$$

For $n = 40$, we obtain:

$$((-1)^{39}) / ((2*\sqrt{40-1/24})) * e^{(\pi*\sqrt{40/6-1/144})}$$

Input

$$\frac{(-1)^{39}}{2\sqrt{40-\frac{1}{24}}} e^{\pi\sqrt{40/6-1/144}}$$

Exact result

$$-\sqrt{\frac{6}{959}} e^{(\sqrt{959} \pi)/12}$$

Decimal approximation

-262.5038317037000029583969363051957612463855512297685679651356868
...

-262.5038317037....

Property

$-\sqrt{\frac{6}{959}} e^{(\sqrt{959} \pi)/12}$ is a transcendental number

Series representations

$$\frac{e^{\pi\sqrt{40/6-1/144}} (-1)^{39}}{2\sqrt{40-\frac{1}{24}}} = -\frac{e^{\pi\sqrt{815/144} \sum_{k=0}^{\infty} (815/144)^{-k} \binom{1/2}{k}}}{2\sqrt{\frac{935}{24}} \sum_{k=0}^{\infty} \left(\frac{935}{24}\right)^{-k} \binom{\frac{1}{2}}{k}}$$

$$\frac{e^{\pi\sqrt{40/6-1/144}} (-1)^{39}}{2\sqrt{40-\frac{1}{24}}} = -\frac{\exp\left(\pi\sqrt{\frac{815}{144}} \sum_{k=0}^{\infty} \frac{\left(-\frac{144}{815}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)}{2\sqrt{\frac{935}{24}} \sum_{k=0}^{\infty} \frac{\left(-\frac{24}{935}\right)^k \left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{e^{\pi \sqrt{40/6-1/144}} (-1)^{39}}{2 \sqrt{40 - \frac{1}{24}}} = - \frac{\exp\left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{959}{144} - z_0\right)^k z_0^{-k}}{k!}\right)}{2 \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{959}{24} - z_0\right)^k z_0^{-k}}{k!}}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

From the mean of the two values, we obtain:

$$\frac{1}{2} \left(\frac{(-1)^{38}}{(2 \sqrt{39-1/24})} * e^{(\pi \sqrt{39/6-1/144})} - \frac{(-1)^{39}}{(2 \sqrt{40-1/24})} * e^{(\pi \sqrt{40/6-1/144})} \right)$$

Input

$$\frac{1}{2} \left(\frac{(-1)^{38}}{2 \sqrt{39 - \frac{1}{24}}} e^{\pi \sqrt{39/6-1/144}} - \frac{(-1)^{39}}{2 \sqrt{40 - \frac{1}{24}}} e^{\pi \sqrt{40/6-1/144}} \right)$$

Exact result

$$\frac{1}{2} \left(\sqrt{\frac{6}{935}} e^{(\sqrt{935} \pi)/12} + \sqrt{\frac{6}{959}} e^{(\sqrt{959} \pi)/12} \right)$$

Decimal approximation

251.27699068265616319052276853347643766175338797421323448294122573
...

251.27699068265616319.....

Alternate forms

$$\frac{e^{(\sqrt{935} \pi)/12} \sqrt{5610}}{1870} + \frac{e^{(\sqrt{959} \pi)/12} \sqrt{5754}}{1918}$$

$$\frac{\sqrt{\frac{3}{2}} \left(959 \sqrt{935} e^{(\sqrt{935} \pi)/12} + 935 \sqrt{959} e^{(\sqrt{959} \pi)/12} \right)}{896665}$$

Expanded form

$$\sqrt{\frac{3}{1870}} e^{(\sqrt{935} \pi)/12} + \sqrt{\frac{3}{1918}} e^{(\sqrt{959} \pi)/12}$$

Series representations

$$\begin{aligned} & \frac{1}{2} \left(\frac{(-1)^{38} e^{\pi \sqrt{39/6-1/144}}}{2 \sqrt{39 - \frac{1}{24}}} - \frac{(-1)^{39} e^{\pi \sqrt{40/6-1/144}}}{2 \sqrt{40 - \frac{1}{24}}} \right) = \\ & \left(e^{\pi \sqrt{815/144} \sum_{k=0}^{\infty} (815/144)^{-k} \binom{1/2}{k}} \sqrt{\frac{911}{24}} \sum_{k=0}^{\infty} \left(\frac{911}{24} \right)^{-k} \binom{\frac{1}{2}}{k} + \right. \\ & \quad \left. e^{\pi \sqrt{791/144} \sum_{k=0}^{\infty} (791/144)^{-k} \binom{1/2}{k}} \sqrt{\frac{935}{24}} \sum_{k=0}^{\infty} \left(\frac{935}{24} \right)^{-k} \binom{\frac{1}{2}}{k} \right) / \\ & \left(4 \sqrt{\frac{911}{24}} \sqrt{\frac{935}{24}} \left(\sum_{k=0}^{\infty} \left(\frac{911}{24} \right)^{-k} \binom{\frac{1}{2}}{k} \right) \sum_{k=0}^{\infty} \left(\frac{935}{24} \right)^{-k} \binom{\frac{1}{2}}{k} \right) \end{aligned}$$

$$\begin{aligned}
& \frac{1}{2} \left(\frac{(-1)^{38} e^{\pi \sqrt{39/6-1/144}}}{2 \sqrt{39 - \frac{1}{24}}} - \frac{(-1)^{39} e^{\pi \sqrt{40/6-1/144}}}{2 \sqrt{40 - \frac{1}{24}}} \right) = \\
& \left(\exp \left(\pi \sqrt{\frac{815}{144}} \sum_{k=0}^{\infty} \frac{\left(-\frac{144}{815}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sqrt{\frac{911}{24}} \sum_{k=0}^{\infty} \frac{\left(-\frac{24}{911}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \right. \\
& \quad \left. \exp \left(\pi \sqrt{\frac{791}{144}} \sum_{k=0}^{\infty} \frac{\left(-\frac{144}{791}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sqrt{\frac{935}{24}} \sum_{k=0}^{\infty} \frac{\left(-\frac{24}{935}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) / \\
& \left(4 \sqrt{\frac{911}{24}} \sqrt{\frac{935}{24}} \left(\sum_{k=0}^{\infty} \frac{\left(-\frac{24}{911}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \sum_{k=0}^{\infty} \frac{\left(-\frac{24}{935}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right)
\end{aligned}$$

$$\begin{aligned}
& \frac{1}{2} \left(\frac{(-1)^{38} e^{\pi \sqrt{39/6-1/144}}}{2 \sqrt{39 - \frac{1}{24}}} - \frac{(-1)^{39} e^{\pi \sqrt{40/6-1/144}}}{2 \sqrt{40 - \frac{1}{24}}} \right) = \\
& \left(\exp \left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{959}{144} - z_0\right)^k z_0^{-k}}{k!} \right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{935}{24} - z_0\right)^k z_0^{-k}}{k!} + \right. \\
& \quad \left. \exp \left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{935}{144} - z_0\right)^k z_0^{-k}}{k!} \right) \right. \\
& \quad \left. \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{959}{24} - z_0\right)^k z_0^{-k}}{k!} \right) / \\
& \left(4 \sqrt{z_0} \left(\sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{935}{24} - z_0\right)^k z_0^{-k}}{k!} \right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{959}{24} - z_0\right)^k z_0^{-k}}{k!} \right)
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

Now, if we consider:

251.27699068265616319 GeV = kg

Input interpretation

convert 251.2769906826561632 GeV/c² to kilograms

Result

$4.479419230712191826 \times 10^{-25}$ kg (kilograms)

$4.47941923 \dots \times 10^{-25}$ kg

Interpretations

mass

Corresponding quantities

Relativistic energy E from $E = mc^2$:

251 GeV (gigaelectronvolts)

Characteristic length L from $L = h/(mc)$:

4.9 am (attometers)

4.9×10^{-18} meters

Thermal de Broglie wavelength at 100 K from $\lambda = h/(2\pi mkT)^{1/2}$:

11 pm (picometers)

Characteristic time T from $T = h/(mc^2)$:

1.6×10^{-26} seconds

Thermodynamic temperature T from $kT = mc^2$:

2.916×10^{15} K (kelvins)

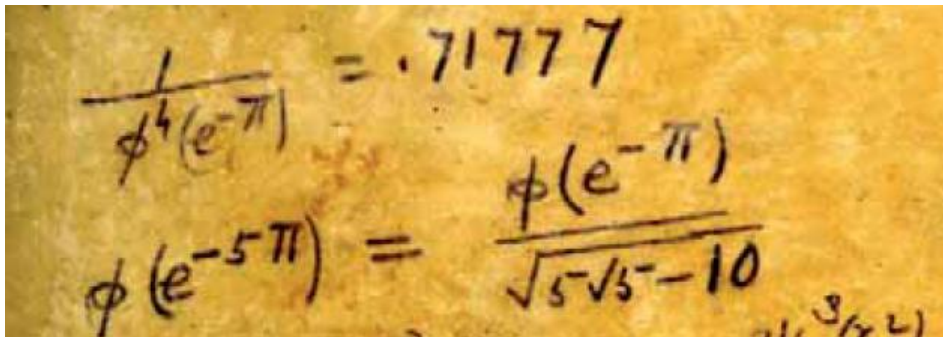
Compton frequency ν from $\nu = mc^2/h$:

$$6.076 \times 10^{25} \text{ Hz (hertz)}$$

Relative atomic mass A_r from $A_r = m_a N_A / M_u$:

$$270$$

From:


$$\frac{1}{x^4(e^{-\pi})} = .71777$$
$$\phi(e^{-5\pi}) = \frac{\phi(e^{-\pi})}{\sqrt{5}\sqrt{5}-10}$$

3/2

$$1/(x^4*(e^{-\pi})) = 0.71777$$

Input

$$\frac{1}{x^4 e^{-\pi}} = 0.71777$$

Result

$$\frac{e^{\pi}}{x^4} = 0.71777$$

Alternate form assuming x is real

$$\frac{23.1407}{x^4} = 0.71777$$

Alternate form assuming x is positive

$$x = 2.38286 \text{ (for } x \neq 0)$$

Real solutions

$$x \approx -2.38286$$

$$x \approx 2.38286$$

Complex solutions

$$x = -2.38286 i$$

$$x = 2.38286 i$$

$$(2.38286(e^{-\pi})) / \sqrt{5\sqrt{5}-10}$$

Input interpretation

$$\frac{2.38286 e^{-\pi}}{\sqrt{5\sqrt{5}-10}}$$

Result

0.0947804205531183821091446785537477123050223931074801027737007753

...

0.0947804205....

Series representations

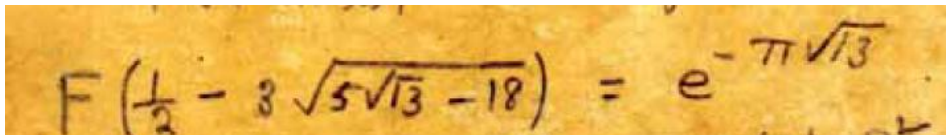
$$\frac{2.38286 e^{-\pi}}{\sqrt{5 \sqrt{5} - 10}} = \frac{2.38286 e^{-\pi}}{\sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (-11+5 \sqrt{5})^k}{k!}}$$

$$\frac{2.38286 e^{-\pi}}{\sqrt{5 \sqrt{5} - 10}} = - \frac{4.76572 e^{-\pi} \sqrt{\pi}}{\sum_{j=0}^{\infty} \text{Res}_{s=-j} \Gamma\left(-\frac{1}{2} - s\right) \Gamma(s) (-11 + 5 \sqrt{5})^{-s}}$$

$$\frac{2.38286 e^{-\pi}}{\sqrt{5 \sqrt{5} - 10}} = \frac{2.38286 e^{-\pi}}{\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5(-2+\sqrt{5})-z_0)^k z_0^{-k}}{k!}}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

From:



$$F\left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18}\right) = e^{-\pi \sqrt{13}}$$

$$x*(1/2-3*(5\sqrt{13}-18)^{0.5}) = e^{(-\pi*\sqrt{13})}$$

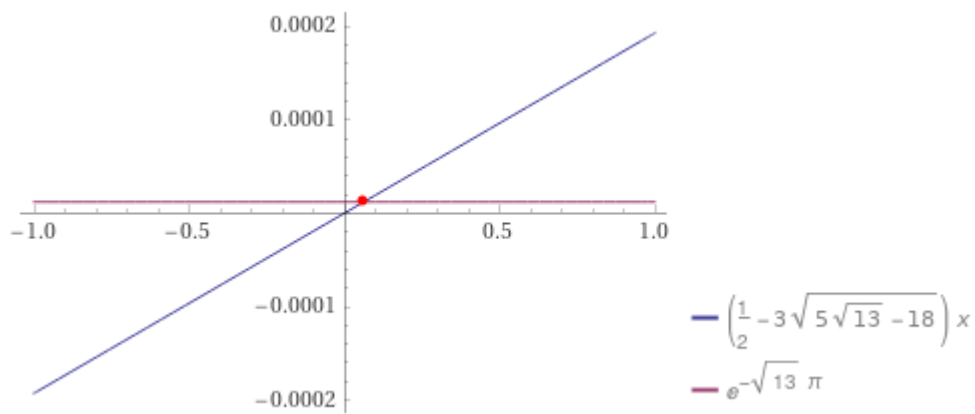
Input

$$x\left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18}\right) = e^{-\pi \sqrt{13}}$$

Exact result

$$\left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18}\right) x = e^{-\sqrt{13} \pi}$$

Plot



Alternate forms

$$\left(\frac{1}{2} - \frac{3}{\sqrt{18 + 5\sqrt{13}}}\right)x = e^{-\sqrt{13}\pi}$$

$$-\frac{1}{2}\left(6\sqrt{5\sqrt{13}-18}-1\right)x = e^{-\sqrt{13}\pi}$$

$$-\frac{x}{2(-649-180\sqrt{13})\left(1+\sqrt{1+\frac{1}{-649-180\sqrt{13}}}\right)} = e^{-\sqrt{13}\pi}$$

Expanded form

$$\frac{x}{2} - 3\sqrt{5\sqrt{13}-18}x = e^{-\sqrt{13}\pi}$$

Solution

$$x = \frac{2 e^{-\sqrt{13} \pi}}{1 - 6 \sqrt{5 \sqrt{13} - 18}}$$

$$x \approx 0.062506$$

$$0.062506 * (1/2 - 3 * (5 \sqrt{13} - 18)^{0.5})$$

Input

$$0.062506 \left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18} \right)$$

Result

0.0000120412327927454591570051506448049249304516889991271959882359

...

0.00001204123279....

$$e^{(-\pi * \sqrt{13})}$$

Input

$$e^{-\pi \sqrt{13}}$$

Exact result

$$e^{-\sqrt{13} \pi}$$

Decimal approximation

0.0000120412367996135300738937711157922721030756151852470659550085

...

0.00001204123679....

Property

$e^{-\sqrt{13} \pi}$ is a transcendental number

Series representations

$$e^{-\pi\sqrt{13}} = e^{-\pi\sqrt{12} \sum_{k=0}^{\infty} 12^{-k} \binom{1/2}{k}}$$

$$e^{-\pi\sqrt{13}} = \exp\left(-\pi\sqrt{12} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{12}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$e^{-\pi\sqrt{13}} = \exp\left(-\frac{\pi \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 12^{-s} \Gamma\left(-\frac{1}{2}-s\right) \Gamma(s)}{2\sqrt{\pi}}\right)$$

Integral representation

$$(1+z)^a = \frac{\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{\Gamma(s) \Gamma(-a-s)}{z^s} ds}{(2\pi i) \Gamma(-a)} \text{ for } (0 < \gamma < -\operatorname{Re}(a) \text{ and } |\arg(z)| < \pi)$$

From:

$$0.062506 \left(\frac{1}{2} - 3\sqrt{5\sqrt{13}-18} \right)$$

and the previous expressions,

$$\frac{2.38286 e^{-\pi}}{\sqrt{5\sqrt{5}-10}}$$

after some calculations, we obtain:

$$\frac{1}{\pi^3} \left[\frac{1}{\left(\left(\left(0.062506 \left(\frac{1}{2} - 3\sqrt{5\sqrt{13}-18} \right)^{0.5} \right) \right) \right)} \cdot \frac{1}{\left(\left(\left(\frac{1}{\left(\left(2.38286 e^{-\pi} \right) \right)} \right) \right)} \cdot \frac{1}{\sqrt{5\sqrt{5}-10}} \right)} \right]$$

Input interpretation

$$\frac{1}{\pi^3} \left(\frac{1}{0.062506 \left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18} \right)} \times \frac{1}{\frac{1}{(2.38286 e^{-\pi}) \times \frac{1}{\sqrt{5 \sqrt{5} - 10}}}} \right)$$

Result

253.862...

253.862

253.862 GeV = Kg

Input interpretation

convert 253.862 GeV/c² to kilograms

Result

4.5255 × 10⁻²⁵ kg (kilograms)

4.5255*10⁻²⁵ kg

Series representations

$$\frac{1}{\frac{0.062506 \left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18} \right)}{\frac{2.38286 e^{-\pi}}{\sqrt{5 \sqrt{5} - 10}}}} \pi^3 = - \left((12.7074 e^{-\pi}) / \left(\pi^3 \sqrt{z_0} \left(-0.166667 + \sqrt{-18 + 5 \sqrt{z_0}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2} \right)_k (13 - z_0)^k z_0^{-k}}{k!} \right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2} \right)_k (5(-2 + \sqrt{5}) - z_0)^k z_0^{-k}}{k!} \right) \right)$$

for (not (z₀ ∈ ℝ and -∞ < z₀ ≤ 0))

$$\begin{aligned}
& \frac{1}{\left(0.062506 \left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18}\right)\right) \pi^3} = \\
& \frac{\frac{2.38286 e^{-\pi}}{\sqrt{5 \sqrt{5} - 10}}}{- \left((12.7074 e^{-\pi}) / \left(\pi^3 \exp \left(i \pi \left[\frac{\arg(-10 - x + 5 \sqrt{5})}{2 \pi} \right] \right) \right. \right. \\
& \quad \left. \sqrt{x} \left(-0.166667 + \sqrt{ \left(-18 + 5 \exp \left(i \pi \left[\frac{\arg(13 - x)}{2 \pi} \right] \right) \right. \right. \right. \\
& \quad \left. \left. \left. \sqrt{x} \sum_{k=0}^{\infty} \frac{(-1)^k (13 - x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \right) \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \frac{(-1)^k x^{-k} \left(-\frac{1}{2}\right)_k (-x + 5(-2 + \sqrt{5}))^k}{k!} \right) \right) \right) \text{ for } (x \in \mathbb{R} \text{ and } x < 0)
\end{aligned}$$

$$\begin{aligned}
& \frac{1}{\left(0.062506 \left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18}\right)\right) \pi^3} = \\
& \frac{\frac{2.38286 e^{-\pi}}{\sqrt{5 \sqrt{5} - 10}}}{- \left(\left(12.7074 e^{-\pi} \left(\frac{1}{z_0} \right)^{-1/2 \lfloor \arg(-10 + 5 \sqrt{5} - z_0)/(2 \pi) \rfloor} z_0^{-1/2 - 1/2 \lfloor \arg(-10 + 5 \sqrt{5} - z_0)/(2 \pi) \rfloor} \right) / \right. \\
& \quad \left(\pi^3 \left(-0.166667 + \sqrt{ \left(-18 + 5 \left(\frac{1}{z_0} \right)^{1/2 \lfloor \arg(13 - z_0)/(2 \pi) \rfloor} \right. \right. \right. \right. \\
& \quad \left. \left. \left. z_0^{1/2 + 1/2 \lfloor \arg(13 - z_0)/(2 \pi) \rfloor} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (13 - z_0)^k z_0^{-k}}{k!} \right) \right) \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5(-2 + \sqrt{5}) - z_0)^k z_0^{-k}}{k!} \right) \right) \right)
\end{aligned}$$

We obtain also:

$$\begin{aligned}
& ((1/(4\pi^3) [1/(((0.062506*(1/2-3*(5\sqrt{13}-18)^{0.5})))) * 1/ (((1/(((2.38286(e^{\wedge}-\pi)) \\
& * 1/\sqrt{5\sqrt{5}-10})))))))] + (((\sqrt{(10-2\sqrt{5})} - 2))/(\sqrt{5}-1)))^{0.5})^2
\end{aligned}$$

Input interpretation

$$\left(\frac{1}{4\pi^3} \left(\frac{1}{0.062506 \left(\frac{1}{2} - 3\sqrt{5\sqrt{13}-18} \right)} \times \frac{1}{(2.38286 e^{-\pi}) \times \frac{1}{\sqrt{5\sqrt{5}-10}}} \right) + \sqrt{\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}} \right)^2$$

Result

4095.81...

4095.81.... $\approx 4096 = 64^2$

$27((1/(4\pi^3) [1/(((0.062506*(1/2-3*(5\sqrt{13}-18)^{0.5}))) *1/ (((1/(((2.38286(e^{-\pi})) *1/\sqrt{5\sqrt{5}-10})))))))]+(((\sqrt{10-2\sqrt{5}}-2)/(\sqrt{5}-1))^{0.5}))+1$

Input interpretation

$$27 \left(\frac{1}{4\pi^3} \left(\frac{1}{0.062506 \left(\frac{1}{2} - 3\sqrt{5\sqrt{13}-18} \right)} \times \frac{1}{(2.38286 e^{-\pi}) \times \frac{1}{\sqrt{5\sqrt{5}-10}}} \right) + \sqrt{\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}} \right) + 1$$

Result

1728.96...

1728.96.... ≈ 1729

This result is very near to the mass of candidate glueball **$f_0(1710)$ scalar meson**. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. ($1728 = 8^2 * 3^3$) The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

$$((27((1/(4\pi^3) [1/(((0.062506*(1/2-3*(5\sqrt{13}-18)^{0.5}))) *1/ (((1/(((2.38286(e^{-\pi} \pi)) *1/\sqrt{5\sqrt{5}-10})))))))]+(((\sqrt{10-2\sqrt{5}} -2)/(\sqrt{5}-1))^{0.5})+1))^{1/15}$$

Input interpretation

$$\left(27 \left[\frac{1}{4 \pi^3} \left(\frac{1}{0.062506 \left(\frac{1}{2} - 3 \sqrt{5 \sqrt{13} - 18} \right)} \times \frac{1}{\frac{1}{(2.38286 e^{-\pi}) \times \frac{1}{\sqrt{5 \sqrt{5} - 10}}}} \right) + \sqrt{\frac{\sqrt{10 - 2 \sqrt{5}} - 2}{\sqrt{5} - 1}} + 1 \right] \right)^{(1/15)}$$

Result

1.643813...

$$1.643813.... \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 ... \text{ (trace of the instanton shape)}$$

Mathematical connections with some sectors of String Theory

Observations

We note that, from the number 8, we obtain as follows:

$$8^2$$

$$64$$

$$8^2 \times 2 \times 8$$

$$1024$$

$$8^4 = 8^2 \times 2^6$$

$$\text{True}$$

$$8^4 = 4096$$

$$8^2 \times 2^6 = 4096$$

$$2^{13} = 2 \times 8^4$$

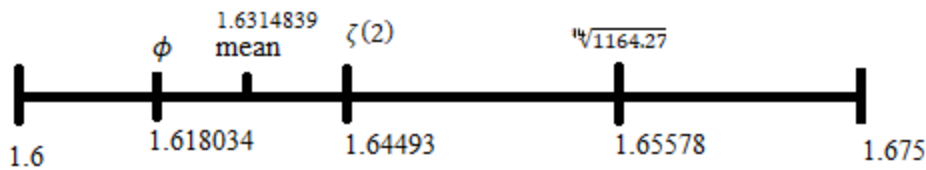
$$\text{True}$$

$$2^{13} = 8192$$

$$2 \times 8^4 = 8192$$

We notice how from the numbers 8 and 2 we get 64, 1024, 4096 and 8192, and that 8 is the fundamental number. In fact $8^2 = 64$, $8^3 = 512$, $8^4 = 4096$. We define it "fundamental number", since 8 is a Fibonacci number, which by rule, divided by the previous one, which is 5, gives 1.6, a value that tends to the golden ratio, as for all numbers in the Fibonacci sequence

“Golden” Range



Finally we note how $8^2 = 64$, multiplied by 27, to which we add 1, is equal to 1729, the so-called "Hardy-Ramanujan number". Then taking the 15th root of 1729, we obtain a value close to $\zeta(2)$ that 1.6438 ..., which, in turn, is included in the range of what we call "golden numbers"

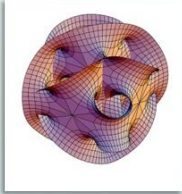
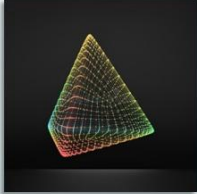
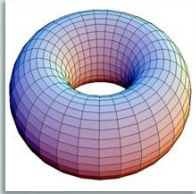
Furthermore for all the results very near to 1728 or 1729, adding $64 = 8^2$, one obtain values about equal to 1792 or 1793. These are values almost equal to the Planck multipole spectrum frequency 1792.35 and to the hypothetical Gluino mass

We have that:

Outlook

Remarkably rich (apparently **UNIQUE**) framework

BUT :



Why a given **“shape” of the extra dimensions** ?
[**CRUCIAL**, it determines the predictions for α , ...]

⏮ ⏪ ⏩ ⏭A. Sagnotti – AstronomiAmo, 23.4.202021

From: A. Sagnotti – AstronomiAmo, 23.04.2020

In the above figure, it is said that: “why a given shape of the extra dimensions? Crucial, it determines the predictions for α ”.

We propose that whatever shape the compactified dimensions are, their geometry must be based on the values of the golden ratio and $\zeta(2)$, (the latter connected to 1728 or 1729, whose fifteenth root provides an excellent approximation to the above mentioned value) which are recurrent as solutions of the equations that we are going to develop. It is important to specify that the initial conditions are **always** values belonging to a fundamental chapter of the work of S. Ramanujan "Modular equations and Approximations to Pi" (see references). These values are some multiples of 8 (64 and 4096), 276, which added to 4096, is equal to 4372, and finally $e^{\pi\sqrt{22}}$

We obtain, in certain cases, the following connections:

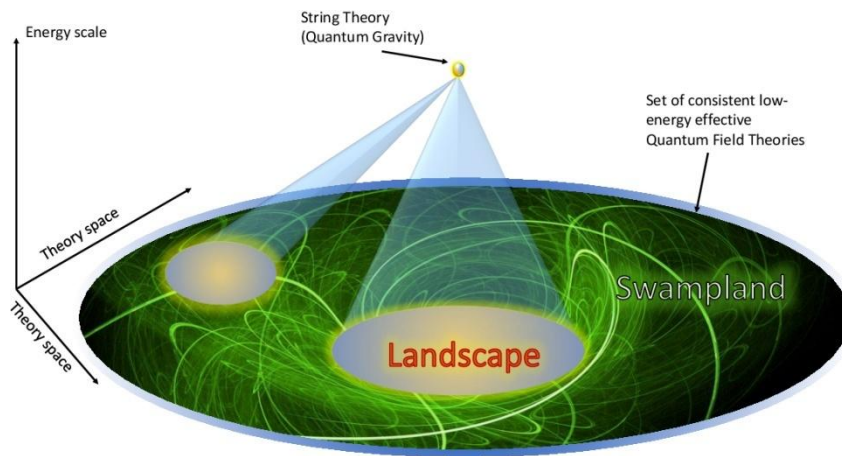
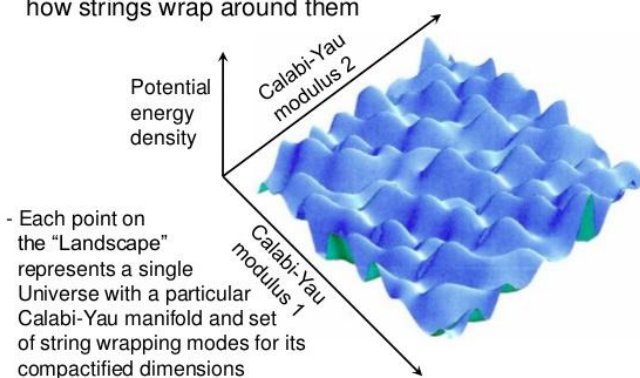


Fig. 1

The String Theory “Landscape”

- Graph axes show only 2 out of hundreds of parameters (“moduli”) that determine the exact Calabi-Yau manifolds and how strings wrap around them



- Each point on the “Landscape” represents a single Universe with a particular Calabi-Yau manifold and set of string wrapping modes for its compactified dimensions
- Each Universe could be realized in a separate post-inflation “bubble”

Fig. 2

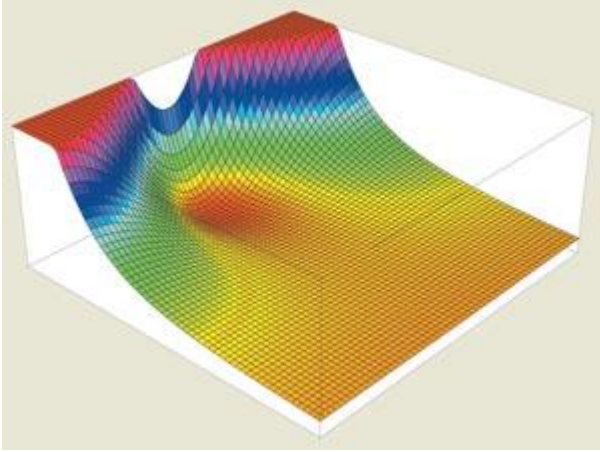


Fig. 3

Stringscape - a small part of the string-theory landscape showing the new de Sitter solution as a local minimum of the energy (vertical axis). The global minimum occurs at the infinite size of the extra dimensions on the extreme right of the figure.

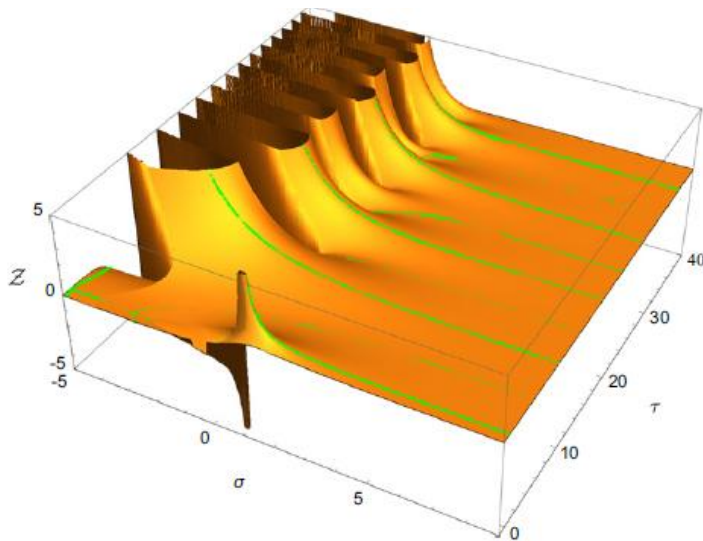


Figure 2. Lines in the complex plane where the Riemann zeta function ζ is real (green) depicted on a relief representing the positive absolute value of ζ for arguments $s \equiv \sigma + i\tau$ where the real part of ζ is positive, and the negative absolute value of ζ where the real part of ζ is negative. This representation brings out most clearly that the lines of constant phase corresponding to phases of integer multiples of 2π run down the hills on the left-hand side, turn around on the right and terminate in the non-trivial zeros. This pattern repeats itself infinitely many times. The points of arrival and departure on the right-hand side of the picture are equally spaced and given by equation (11).

Fig. 4

With regard the Fig. 4 the points of arrival and departure on the right-hand side of the picture are equally spaced and given by the following equation:

$$\tau'_k \equiv k \frac{\pi}{\ln 2},$$

with $k = \dots, -2, -1, 0, 1, 2, \dots$

we obtain:

$$2\pi/(\ln(2))$$

Input:

$$2 \times \frac{\pi}{\log(2)}$$

Exact result:

$$\frac{2\pi}{\log(2)}$$

Decimal approximation:

9.0647202836543876192553658914333336203437229354475911683720330958
...

9.06472028365....

Alternative representations:

$$\frac{2\pi}{\log(2)} = \frac{2\pi}{\log_e(2)}$$

$$\frac{2\pi}{\log(2)} = \frac{2\pi}{\log(a) \log_a(2)}$$

$$\frac{2\pi}{\log(2)} = \frac{2\pi}{2 \coth^{-1}(3)}$$

Series representations:

$$\frac{2\pi}{\log(2)} = \frac{2\pi}{2i\pi \left\lfloor \frac{\arg(2-x)}{2\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (2-x)^k x^{-k}}{k}} \quad \text{for } x < 0$$

$$\frac{2\pi}{\log(2)} = \frac{2\pi}{\log(z_0) + \left\lfloor \frac{\arg(2-z_0)}{2\pi} \right\rfloor \left(\log\left(\frac{1}{z_0}\right) + \log(z_0) \right) - \sum_{k=1}^{\infty} \frac{(-1)^k (2-z_0)^k z_0^{-k}}{k}}$$

$$\frac{2\pi}{\log(2)} = \frac{2\pi}{2i\pi \left\lfloor \frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\pi} \right\rfloor + \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k (2-z_0)^k z_0^{-k}}{k}}$$

Integral representations:

$$\frac{2\pi}{\log(2)} = \frac{2\pi}{\int_1^2 \frac{1}{t} dt}$$

$$\frac{2\pi}{\log(2)} = \frac{4i\pi^2}{\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{\Gamma(-s)^2 \Gamma(1+s)}{\Gamma(1-s)} ds} \quad \text{for } -1 < \gamma < 0$$

From which:

$$(2\pi/(\ln(2))) \cdot (1/12 \pi \log(2))$$

Input:

$$\left(2 \times \frac{\pi}{\log(2)}\right) \left(\frac{1}{12} \pi \log(2)\right)$$

$\log(x)$ is the natural logarithm

Exact result:

$$\frac{\pi^2}{6}$$

Decimal approximation:

1.6449340668482264364724151666460251892189499012067984377355582293
...

$$1.6449340668\dots = \zeta(2) = \frac{\pi^2}{6} = 1.644934 \dots$$

From:

Modular equations and approximations to π - Srinivasa Ramanujan
Quarterly Journal of Mathematics, XLV, 1914, 350 – 372

We have that:

Hence

$$\begin{aligned} 64g_{22}^{24} &= e^{\pi\sqrt{22}} - 24 + 276e^{-\pi\sqrt{22}} - \dots, \\ 64g_{22}^{-24} &= 4096e^{-\pi\sqrt{22}} + \dots, \end{aligned}$$

so that

$$64(g_{22}^{24} + g_{22}^{-24}) = e^{\pi\sqrt{22}} - 24 + 4372e^{-\pi\sqrt{22}} + \dots = 64\{(1 + \sqrt{2})^{12} + (1 - \sqrt{2})^{12}\}.$$

Hence

$$e^{\pi\sqrt{22}} = 2508951.9982\dots$$

Again

$$G_{37} = (6 + \sqrt{37})^{\frac{1}{4}},$$

$$\begin{aligned} 64G_{37}^{24} &= e^{\pi\sqrt{37}} + 24 + 276e^{-\pi\sqrt{37}} + \dots, \\ 64G_{37}^{-24} &= 4096e^{-\pi\sqrt{37}} - \dots, \end{aligned}$$

so that

$$64(G_{37}^{24} + G_{37}^{-24}) = e^{\pi\sqrt{37}} + 24 + 4372e^{-\pi\sqrt{37}} - \dots = 64\{(6 + \sqrt{37})^6 + (6 - \sqrt{37})^6\}.$$

Hence

$$e^{\pi\sqrt{37}} = 199148647.999978\dots$$

Similarly, from

$$g_{58} = \sqrt{\left(\frac{5 + \sqrt{29}}{2}\right)},$$

we obtain

$$64(g_{58}^{24} + g_{58}^{-24}) = e^{\pi\sqrt{58}} - 24 + 4372e^{-\pi\sqrt{58}} + \dots = 64\left\{\left(\frac{5 + \sqrt{29}}{2}\right)^{12} + \left(\frac{5 - \sqrt{29}}{2}\right)^{12}\right\}.$$

Hence

$$e^{\pi\sqrt{58}} = 24591257751.99999982\dots$$

We note that, with regard 4372, we can to obtain the following results:

$$27((4372)^{1/2}-2-1/2(((\sqrt{(10-2\sqrt{5})}-2))(\sqrt{5}-1))))+\phi$$

Input

$$27\left(\sqrt{4372}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi$$

ϕ is the golden ratio

Result

$$\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2(\sqrt{5}-1)}\right)$$

Decimal approximation

1729.0526944170905625170637208637148763684189306538457854815447023

...

1729.0526944....

This result is very near to the mass of candidate glueball **f₀(1710) scalar meson**. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. (1728 = 8² * 3³) The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

Alternate forms

$$\frac{1}{8}\left(-27\sqrt{5(10-2\sqrt{5})}+58\sqrt{5}+432\sqrt{1093}-27\sqrt{2(5-\sqrt{5})}-374\right)$$

$$\phi-54+54\sqrt{1093}+\frac{27}{4}\left(1+\sqrt{5}-\sqrt{2(5+\sqrt{5})}\right)$$

$$\phi - 54 + 54\sqrt{1093} - \frac{27\left(\sqrt{10-2\sqrt{5}} - 2\right)}{2(\sqrt{5} - 1)}$$

Minimal polynomial

$$\begin{aligned} &256x^8 + 95744x^7 - 3248750080x^6 - \\ &914210725504x^5 + 1549835555492184x^4 + \\ &2911478392539914656x^3 - 32941144911224677091680x^2 - \\ &3092528914069760354714456x + 26320050609744039027169013041 \end{aligned}$$

Expanded forms

$$-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10-2\sqrt{5}} - \frac{27}{8}\sqrt{5(10-2\sqrt{5})}$$

$$-\frac{107}{2} + \frac{\sqrt{5}}{2} + 54\sqrt{1093} + \frac{27}{\sqrt{5}-1} - \frac{27\sqrt{10-2\sqrt{5}}}{2(\sqrt{5}-1)}$$

Series representations

$$\begin{aligned} &27\left(\sqrt{4372} - 2 - \frac{\sqrt{10-2\sqrt{5}} - 2}{(\sqrt{5}-1)2}\right) + \phi = \\ &\left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} + \right. \\ &\quad 108\sqrt{1093}\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} + 2\phi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} - \\ &\quad \left. 27\sqrt{9-2\sqrt{5}} \sum_{k=0}^{\infty} \binom{\frac{1}{2}}{k} (9-2\sqrt{5})^{-k}\right) / \left(2\left(-1 + \sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k}\right)\right) \end{aligned}$$

$$\begin{aligned}
& 27 \left(\sqrt{4372} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{(\sqrt{5} - 1)2} \right) + \phi = \\
& \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \right. \\
& \quad 108\sqrt{1093} \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + 2\phi \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} - \\
& \quad \left. 27\sqrt{9 - 2\sqrt{5}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (9 - 2\sqrt{5})^{-k}}{k!} \right) / \\
& \left(2 \left(-1 + \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \right)
\end{aligned}$$

$$\begin{aligned}
& 27 \left(\sqrt{4372} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{(\sqrt{5} - 1)2} \right) + \phi = \\
& \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} + \right. \\
& \quad 108\sqrt{1093} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} + \\
& \quad 2\phi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} - \\
& \quad \left. 27\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (10 - 2\sqrt{5} - z_0)^k z_0^{-k}}{k!} \right) / \\
& \left(2 \left(-1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} \right) \right)
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

Or:

$$27((4096+276)^{1/2}-2-1/2(((\sqrt{(10-2\sqrt{5})}-2))/(\sqrt{5}-1))))+\phi$$

Input

$$27 \left(\sqrt{4096 + 276} - 2 - \frac{1}{2} \times \frac{\sqrt{10 - 2\sqrt{5}} - 2}{\sqrt{5} - 1} \right) + \phi$$

ϕ is the golden ratio

Result

$$\phi + 27 \left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2(\sqrt{5} - 1)} \right)$$

Decimal approximation

1729.0526944170905625170637208637148763684189306538457854815447023

...

[1729.0526944.... as above](#)

Alternate forms

$$\frac{1}{8} \left(-27 \sqrt{5(10 - 2\sqrt{5})} + 58\sqrt{5} + 432\sqrt{1093} - 27 \sqrt{2(5 - \sqrt{5})} - 374 \right)$$

$$\phi - 54 + 54\sqrt{1093} + \frac{27}{4} \left(1 + \sqrt{5} - \sqrt{2(5 + \sqrt{5})} \right)$$

$$\phi - 54 + 54\sqrt{1093} - \frac{27 \left(\sqrt{10 - 2\sqrt{5}} - 2 \right)}{2(\sqrt{5} - 1)}$$

Minimal polynomial

$$256x^8 + 95744x^7 - 3248750080x^6 - 914210725504x^5 + 15498355554921184x^4 + 2911478392539914656x^3 - 32941144911224677091680x^2 - 3092528914069760354714456x + 26320050609744039027169013041$$

Expanded forms

$$-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10-2\sqrt{5}} - \frac{27}{8}\sqrt{5(10-2\sqrt{5})}$$

$$-\frac{107}{2} + \frac{\sqrt{5}}{2} + 54\sqrt{1093} + \frac{27}{\sqrt{5}-1} - \frac{27\sqrt{10-2\sqrt{5}}}{2(\sqrt{5}-1)}$$

Series representations

$$27\left(\sqrt{4096+276}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{(\sqrt{5}-1)2}\right)+\phi=$$

$$\left(162-108\sqrt{1093}-2\phi-108\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}+\right.$$

$$108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}+2\phi\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}-$$

$$\left.27\sqrt{9-2\sqrt{5}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(9-2\sqrt{5})^{-k}\right)/\left(2\left(-1+\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}\right)\right)$$

$$\begin{aligned}
& 27 \left(\sqrt{4096 + 276} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{(\sqrt{5} - 1)2} \right) + \phi = \\
& \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \right. \\
& \quad 108\sqrt{1093} \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + 2\phi \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} - \\
& \quad \left. 27\sqrt{9 - 2\sqrt{5}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (9 - 2\sqrt{5})^{-k}}{k!} \right) / \\
& \left(2 \left(-1 + \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right) \right)
\end{aligned}$$

$$\begin{aligned}
& 27 \left(\sqrt{4096 + 276} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{(\sqrt{5} - 1)2} \right) + \phi = \\
& \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} + \right. \\
& \quad 108\sqrt{1093} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} + \\
& \quad 2\phi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} - \\
& \quad \left. 27\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (10 - 2\sqrt{5} - z_0)^k z_0^{-k}}{k!} \right) / \\
& \left(2 \left(-1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} \right) \right)
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

From which:

$$(27((4372)^{1/2}-2-1/2(((\sqrt{10-2\sqrt{5}}-2))/(\sqrt{5}-1))))+\phi)^{1/15}$$

Input

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi}$$

ϕ is the golden ratio

Exact result

$$\sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2(\sqrt{5}-1)}\right)}$$

Decimal approximation

1.6438185685849862799902301317036810054185756873505184804834183124
...

$$1.64381856858\dots\approx\zeta(2)=\frac{\pi^2}{6}=1.644934\dots$$

Alternate forms

$$\sqrt[15]{\phi-54+54\sqrt{1093}-\frac{27\left(\sqrt{10-2\sqrt{5}}-2\right)}{2(\sqrt{5}-1)}}$$

$$\sqrt[15]{\frac{1}{\frac{2(\sqrt{5}-1)}{166-108\sqrt{5}-108\sqrt{1093}+108\sqrt{5465}-27\sqrt{2(5-\sqrt{5})}}}}$$

$$\sqrt[15]{\text{root of } 256x^8 + 95744x^7 - 3248750080x^6 - 914210725504x^5 + 154983555492184x^4 + 2911478392539914656x^3 - 32941144911224677091680x^2 - 3092528914069760354714456x + 26320050609744039027169013041 \text{ near } x = 1729.05}$$

Minimal polynomial

$$256x^{120} + 95744x^{105} - 3248750080x^{90} - 914210725504x^{75} + 154983555492184x^{60} + 2911478392539914656x^{45} - 32941144911224677091680x^{30} - 3092528914069760354714456x^{15} + 26320050609744039027169013041$$

Expanded forms

$$\sqrt[15]{\frac{1}{2}(1 + \sqrt{5}) + 27 \left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2(\sqrt{5} - 1)} \right)}$$

$$\sqrt[15]{-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10 - 2\sqrt{5}} - \frac{27}{8}\sqrt{5(10 - 2\sqrt{5})}}$$

All 15th roots of $\phi + 27(-2 + 2\sqrt{1093} - (\sqrt{10 - 2\sqrt{5}} - 2)/(2(\sqrt{5} - 1)))$

$$e^0 \sqrt[15]{\phi + 27 \left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2(\sqrt{5} - 1)} \right)} \approx 1.64382 \text{ (real, principal root)}$$

$$e^{(2i\pi)/15} \sqrt[15]{\phi + 27 \left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2(\sqrt{5} - 1)} \right)} \approx 1.50170 + 0.6686i$$

$$e^{(4i\pi)/15} \sqrt[15]{\phi + 27 \left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2(\sqrt{5} - 1)} \right)} \approx 1.0999 + 1.2216i$$

$$e^{(2i\pi)/5} \sqrt[15]{\phi + 27 \left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2(\sqrt{5} - 1)} \right)} \approx 0.5080 + 1.5634i$$

$$e^{(8i\pi)/15} \sqrt[15]{\phi + 27 \left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2(\sqrt{5} - 1)} \right)} \approx -0.17183 + 1.63481i$$

Series representations

$$\begin{aligned} & \sqrt[15]{27 \left(\sqrt{4372} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{(\sqrt{5} - 1)2} \right)} + \phi = \\ & \frac{1}{\sqrt[15]{2}} \left(\left(\left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} + 108\sqrt{1093}\sqrt{4} \right. \right. \right. \\ & \quad \left. \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} + 2\phi\sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} - 27\sqrt{9 - 2\sqrt{5}} \right. \\ & \quad \left. \left. \sum_{k=0}^{\infty} \binom{\frac{1}{2}}{k} (9 - 2\sqrt{5})^{-k} \right) / \left(-1 + \sqrt{4} \sum_{k=0}^{\infty} 4^{-k} \binom{\frac{1}{2}}{k} \right) \right)^{(1/15)} \end{aligned}$$

$$\begin{aligned}
& \sqrt[15]{27 \left(\sqrt{4372} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{(\sqrt{5} - 1)2} \right) + \phi} = \\
& \frac{1}{\sqrt[15]{2}} \left(\left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + \right. \right. \\
& \quad 108\sqrt{1093} \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} + 2\phi \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} - \\
& \quad \left. 27\sqrt{9 - 2\sqrt{5}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (9 - 2\sqrt{5})^{-k}}{k!} \right) / \\
& \quad \left(-1 + \sqrt{4} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{4}\right)^k \left(-\frac{1}{2}\right)_k}{k!} \right)^{(1/15)}
\end{aligned}$$

$$\begin{aligned}
& \sqrt[15]{27 \left(\sqrt{4372} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{(\sqrt{5} - 1)2} \right) + \phi} = \\
& \frac{1}{\sqrt[15]{2}} \left(\left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} + \right. \right. \\
& \quad 108\sqrt{1093} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} + \\
& \quad 2\phi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} - \\
& \quad \left. 27\sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (10 - 2\sqrt{5} - z_0)^k z_0^{-k}}{k!} \right) / \\
& \quad \left(-1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (5 - z_0)^k z_0^{-k}}{k!} \right)^{(1/15)}
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

Integral representation

$$(1+z)^a = \frac{\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{\Gamma(s)\Gamma(-a-s)}{z^s} ds}{(2\pi i)\Gamma(-a)} \quad \text{for } (0 < \gamma < -\text{Re}(a) \text{ and } |\arg(z)| < \pi)$$

From:

An Update on Brane Supersymmetry Breaking

J. Mourad and A. Sagnotti - arXiv:1711.11494v1 [hep-th] 30 Nov 2017

From the following vacuum equations:

$$T e^{\gamma_E \phi} = - \frac{\beta_E^{(p)} h^2}{\gamma_E} e^{-2(8-p)C + 2\beta_E^{(p)} \phi}$$

$$16 k' e^{-2C} = \frac{h^2 \left(p + 1 - \frac{2\beta_E^{(p)}}{\gamma_E} \right) e^{-2(8-p)C + 2\beta_E^{(p)} \phi}}{(7-p)}$$

$$(A')^2 = k e^{-2A} + \frac{h^2}{16(p+1)} \left(7 - p + \frac{2\beta_E^{(p)}}{\gamma_E} \right) e^{-2(8-p)C + 2\beta_E^{(p)} \phi}$$

we have obtained, from the results almost equals of the equations, putting

$4096 e^{-\pi\sqrt{18}}$ instead of

$$e^{-2(8-p)C + 2\beta_E^{(p)} \phi}$$

a new possible mathematical connection between the two exponentials. Thence, also the values concerning p , C , β_E and ϕ correspond to the exponents of e (i.e. of exp). Thence we obtain for $p = 5$ and $\beta_E = 1/2$:

$$e^{-6C+\phi} = 4096 e^{-\pi\sqrt{18}}$$

Therefore, with respect to the exponentials of the vacuum equations, the Ramanujan's exponential has a coefficient of 4096 which is equal to 64^2 , while $-6C+\phi$ is equal to $-\pi\sqrt{18}$. From this it follows that it is possible to establish mathematically, the dilaton value.

For

$\exp((- \pi \sqrt{18}))$ we obtain:

Input:

$$\exp\left(-\pi \sqrt{18}\right)$$

Exact result:

$$e^{-3\sqrt{2}\pi}$$

Decimal approximation:

$$1.6272016226072509292942156739117979541838581136954016... \times 10^{-6}$$

$$1.6272016... * 10^{-6}$$

Property:

$e^{-3\sqrt{2}\pi}$ is a transcendental number

Series representations:

$$e^{-\pi \sqrt{18}} = e^{-\pi \sqrt{17} \sum_{k=0}^{\infty} 17^{-k} \binom{1/2}{k}}$$

$$e^{-\pi \sqrt{18}} = \exp\left(-\pi \sqrt{17} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{17}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$e^{-\pi \sqrt{18}} = \exp\left(-\frac{\pi \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 17^{-s} \Gamma\left(-\frac{1}{2}-s\right) \Gamma(s)}{2\sqrt{\pi}}\right)$$

Now, we have the following calculations:

$$e^{-6C+\phi} = 4096e^{-\pi\sqrt{18}}$$

$$e^{-\pi\sqrt{18}} = 1.6272016... * 10^{-6}$$

from which:

$$\frac{1}{4096} e^{-6C+\phi} = 1.6272016... * 10^{-6}$$

$$0.000244140625 e^{-6C+\phi} = e^{-\pi\sqrt{18}} = 1.6272016... * 10^{-6}$$

Now:

$$\ln(e^{-\pi\sqrt{18}}) = -13.328648814475 = -\pi\sqrt{18}$$

And:

$$(1.6272016 * 10^{-6}) * 1 / (0.000244140625)$$

Input interpretation:

$$\frac{1.6272016}{10^6} \times \frac{1}{0.000244140625}$$

Result:

0.0066650177536

0.006665017...

Thence:

$$0.000244140625 e^{-6C+\phi} = e^{-\pi\sqrt{18}}$$

Dividing both sides by 0.000244140625, we obtain:

$$\frac{0.000244140625}{0.000244140625} e^{-6C+\phi} = \frac{1}{0.000244140625} e^{-\pi\sqrt{18}}$$

$$e^{-6C+\phi} = 0.0066650177536$$

$$((((\exp((-Pi*\sqrt{18})))))))*1/0.000244140625$$

Input interpretation:

$$\exp\left(-\pi\sqrt{18}\right)\times\frac{1}{0.000244140625}$$

Result:

0.00666501785...

0.00666501785...

Series representations:

$$\frac{\exp(-\pi\sqrt{18})}{0.000244141} = 4096 \exp\left(-\pi\sqrt{17} \sum_{k=0}^{\infty} 17^{-k} \left(\frac{1}{2} \atop k \right)\right)$$

$$\frac{\exp(-\pi \sqrt{18})}{0.000244141} = 4096 \exp\left(-\pi \sqrt{17} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{17}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$\frac{\exp(-\pi \sqrt{18})}{0.000244141} = 4096 \exp\left(-\frac{\pi \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 17^{-s} \Gamma\left(-\frac{1}{2}-s\right) \Gamma(s)}{2 \sqrt{\pi}}\right)$$

Now:

$$e^{-6C+\phi} = 0.0066650177536$$

$$\exp(-\pi \sqrt{18}) \times \frac{1}{0.000244140625} =$$

$$e^{-\pi \sqrt{18}} \times \frac{1}{0.000244140625}$$

$$= 0.00666501785\dots$$

From:

$$\ln(0.00666501784619)$$

Input interpretation:

$$\log(0.00666501784619)$$

Result:

$$-5.010882647757\dots$$

$$-5.010882647757\dots$$

Alternative representations:

$$\log(0.006665017846190000) = \log_e(0.006665017846190000)$$

$$\log(0.006665017846190000) = \log(a) \log_a(0.006665017846190000)$$

$$\log(0.006665017846190000) = -\text{Li}_1(0.993334982153810000)$$

Series representations:

$$\log(0.006665017846190000) = -\sum_{k=1}^{\infty} \frac{(-1)^k (-0.993334982153810000)^k}{k}$$

$$\log(0.006665017846190000) = 2 i \pi \left[\frac{\arg(0.006665017846190000 - x)}{2 \pi} \right] + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.006665017846190000 - x)^k x^{-k}}{k} \quad \text{for } x < 0$$

$$\log(0.006665017846190000) = \left[\frac{\arg(0.006665017846190000 - z_0)}{2 \pi} \right] \log\left(\frac{1}{z_0}\right) + \log(z_0) + \left[\frac{\arg(0.006665017846190000 - z_0)}{2 \pi} \right] \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.006665017846190000 - z_0)^k z_0^{-k}}{k}$$

Integral representation:

$$\log(0.006665017846190000) = \int_1^{0.006665017846190000} \frac{1}{t} dt$$

In conclusion:

$$-6C + \phi = -5.010882647757 \dots$$

and for $C = 1$, we obtain:

$$\phi = -5.010882647757 + 6 = \mathbf{0.989117352243} = \phi$$

Note that the values of n_s (spectral index) 0.965, of the average of the Omega mesons Regge slope 0.987428571 and of the dilaton 0.989117352243, are also connected to the following two Rogers-Ramanujan continued fractions:

$$\frac{e^{\frac{\pi}{5}}}{\sqrt{(\phi-1)\sqrt{5}} - \phi + 1} = 1 - \frac{e^{-\pi}}{1 + \frac{e^{-2\pi}}{1 + \frac{e^{-3\pi}}{1 + \frac{e^{-4\pi}}{1 + \dots}}}} \approx 0.9568666373$$

$$\frac{e^{\frac{-\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1 + \sqrt[5]{\sqrt{\phi^5 \sqrt[4]{5^3}} - 1}} - \phi + 1} = 1 - \frac{e^{-\pi\sqrt{5}}}{1 + \frac{e^{-2\pi\sqrt{5}}}{1 + \frac{e^{-3\pi\sqrt{5}}}{1 + \frac{e^{-4\pi\sqrt{5}}}{1 + \dots}}}} \approx 0.9991104684$$

(<http://www.bitman.name/math/article/102/109/>)

The mean between the two results of the above Rogers-Ramanujan continued fractions is 0.97798855285, value very near to the ψ Regge slope 0.979:

Ψ	3	$m_c = 1500$	0.979	-0.09
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Also performing the 512th root of the inverse value of the Pion meson rest mass 139.57, we obtain:

$$((1/(139.57)))^{1/512}$$

Input interpretation:

$$\sqrt[512]{\frac{1}{139.57}}$$

Result:

0.990400732708644027550973755713301415460732796178555551684...

0.99040073.... result very near to the dilaton value **0.989117352243 = ϕ** and to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\sqrt{5}}}{1 + \sqrt[5]{\sqrt{\phi^5 \sqrt[4]{5^3}} - 1} - \phi + 1} = 1 - \frac{e^{-\pi\sqrt{5}}}{1 + \frac{e^{-2\pi\sqrt{5}}}{1 + \frac{e^{-3\pi\sqrt{5}}}{1 + \frac{e^{-4\pi\sqrt{5}}}{1 + \dots}}}} \approx 0.9991104684$$

From

AdS Vacua from Dilaton Tadpoles and Form Fluxes - *J. Mourad and A. Sagnotti*
 - arXiv:1612.08566v2 [hep-th] 22 Feb 2017 - March 27, 2018

We have:

$$e^{2C} = \frac{2\xi e^{\frac{\phi}{2}}}{1 \pm \sqrt{1 - \frac{\xi T}{3} e^{2\phi}}}$$

$$\frac{h^2}{32} = \frac{\xi^7 e^{4\phi}}{\left(1 \pm \sqrt{1 - \frac{\xi T}{3} e^{2\phi}}\right)^7} \left[\frac{42}{\xi} \left(1 \pm \sqrt{1 - \frac{\xi T}{3} e^{2\phi}}\right) + 5 T e^{2\phi} \right]. \quad (2.7)$$

For

$$T = \frac{16}{\pi^2}$$

$$\xi = 1$$

we obtain:

$$(2 \cdot e^{(0.989117352243/2)}) / (1 + \sqrt{((1 - 1/3 \cdot 16/(\pi)^2 \cdot e^{2 \cdot 0.989117352243})))})$$

Input interpretation:

$$\frac{2 e^{0.989117352243/2}}{1 + \sqrt{1 - \frac{1}{3} \times \frac{16}{\pi^2} e^{2 \times 0.989117352243}}}$$

Result:

0.83941881822... -
 1.4311851867... i

Polar coordinates:

$r = 1.65919106525$ (radius), $\theta = -59.607521917^\circ$ (angle)

1.65919106525..... result very near to the 14th root of the following Ramanujan's class invariant $Q = (G_{505}/G_{101/5})^3 = 1164.2696$ i.e. 1.65578...

Series representations:

$$\frac{2 e^{0.9891173522430000/2}}{1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}}} = \frac{2 e^{0.4945586761215000}}{1 + \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \left(\frac{3}{16}\right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2}\right)^{-k} \binom{\frac{1}{2}}{k}}$$

$$\frac{2 e^{0.9891173522430000/2}}{1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}}} = \frac{2 e^{0.4945586761215000}}{1 + \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \frac{\left(-\frac{3}{16}\right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2}\right)^{-k} \left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{2 e^{0.9891173522430000/2}}{1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}}} = \frac{2 e^{0.4945586761215000}}{1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 - \frac{16 e^{1.978234704486000}}{3 \pi^2} z_0\right)^k z_0^{-k}}{k!}}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

From

$$\frac{h^2}{32} = \frac{\xi^7 e^{4\phi}}{\left(1 \pm \sqrt{1 - \frac{\xi T}{3} e^{2\phi}}\right)^7} \left[\frac{42}{\xi} \left(1 \pm \sqrt{1 - \frac{\xi T}{3} e^{2\phi}}\right) + 5 T e^{2\phi} \right]$$

we obtain:

$$e^{(4 \times 0.989117352243)} / (((1 + \sqrt{1 - \frac{1}{3} \times \frac{16}{\pi^2} e^{(2 \times 0.989117352243)}}))^{7/42} (1 + \sqrt{1 - \frac{1}{3} \times \frac{16}{\pi^2} e^{(2 \times 0.989117352243)}}) + 5 \times \frac{16}{\pi^2} e^{(2 \times 0.989117352243)})$$

Input interpretation:

$$\frac{e^{4 \times 0.989117352243}}{\left(1 + \sqrt{1 - \frac{1}{3} \times \frac{16}{\pi^2} e^{2 \times 0.989117352243}}\right)^7 \left(42 \left(1 + \sqrt{1 - \frac{1}{3} \times \frac{16}{\pi^2} e^{2 \times 0.989117352243}}\right) + 5 \times \frac{16}{\pi^2} e^{2 \times 0.989117352243}\right)}$$

Result:

50.84107889... -
20.34506335... i

Polar coordinates:

$r = 54.76072411$ (radius), $\theta = -21.80979492^\circ$ (angle)

54.76072411.....

Series representations:

$$\left(\left(42 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) + \frac{5 \times 16 e^{2 \times 0.9891173522430000}}{\pi^2} \right) e^{4 \times 0.9891173522430000} \right) / \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right)^7 =$$

$$\left(2 \left(40 e^{5.934704113458000} + 21 e^{3.956469408972000} \pi^2 + 21 e^{3.956469408972000} \pi^2 \right. \right.$$

$$\left. \left. \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \left(\frac{3}{16} \right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2} \right)^{-k} \left(\frac{1}{2} \right)^k \right) \right) /$$

$$\left(\pi^2 \left(1 + \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \left(\frac{3}{16} \right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2} \right)^{-k} \left(\frac{1}{2} \right)^k \right) \right)^7$$

$$\begin{aligned}
& \left(\left(42 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) + \frac{5 \times 16 e^{2 \times 0.9891173522430000}}{\pi^2} \right) \right. \\
& \quad \left. e^{4 \times 0.9891173522430000} \right) / \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right)^7 = \\
& \left(2 \left(40 e^{5.934704113458000} + 21 e^{3.956469408972000} \pi^2 + 21 e^{3.956469408972000} \pi^2 \right. \right. \\
& \quad \left. \left. \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \frac{\left(-\frac{3}{16}\right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2}\right)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \right) / \\
& \left(\pi^2 \left(1 + \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \frac{\left(-\frac{3}{16}\right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2}\right)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \right)^7 \\
& \left(\left(42 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) + \frac{5 \times 16 e^{2 \times 0.9891173522430000}}{\pi^2} \right) \right. \\
& \quad \left. e^{4 \times 0.9891173522430000} \right) / \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right)^7 = \\
& \left(2 \left(40 e^{5.934704113458000} + 21 e^{3.956469408972000} \pi^2 + 21 e^{3.956469408972000} \right. \right. \\
& \quad \left. \left. \pi^2 \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 - \frac{16 e^{1.978234704486000}}{3 \pi^2} - z_0\right)^k z_0^{-k}}{k!} \right) \right) / \\
& \left(\pi^2 \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 - \frac{16 e^{1.978234704486000}}{3 \pi^2} - z_0\right)^k z_0^{-k}}{k!} \right) \right)^7 \\
& \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))
\end{aligned}$$

From which:

$$\begin{aligned}
& e^{(4 \times 0.989117352243)} / (((1 + \sqrt{1 - 1/3 \times 16 / (\pi)^2 \times e^{(2 \times 0.989117352243)}}))^7 \\
& [42(1 + \sqrt{1 - 1/3 \times 16 / (\pi)^2 \times e^{(2 \times 0.989117352243)}}) + 5 \times 16 / (\pi)^2 \times e^{(2 \times 0.989117352243)}] \times 1/34
\end{aligned}$$

Input interpretation:

$$\frac{e^{4 \times 0.989117352243}}{\left(1 + \sqrt{1 - \frac{1}{3} \times \frac{16}{\pi^2} e^{2 \times 0.989117352243}}\right)^7} \left(42 \left(1 + \sqrt{1 - \frac{1}{3} \times \frac{16}{\pi^2} e^{2 \times 0.989117352243}}\right) + 5 \times \frac{16}{\pi^2} e^{2 \times 0.989117352243}\right) \times \frac{1}{34}$$

Result:

1.495325850... -
0.5983842161... *i*

Polar coordinates:

$r = 1.610609533$ (radius), $\theta = -21.80979492^\circ$ (angle)

1.610609533.... result that is a good approximation to the value of the golden ratio
1.618033988749...

Series representations:

$$\left(\left(42 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) + \frac{5 \times 16 e^{2 \times 0.9891173522430000}}{\pi^2} \right) e^{4 \times 0.9891173522430000} \right) / \left(34 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) \right)^7 =$$

$$\left(40 e^{5.934704113458000} + 21 e^{3.956469408972000} \pi^2 + 21 e^{3.956469408972000} \pi^2 \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \left(\frac{3}{16} \right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2} \right)^{-k} \left(\frac{1}{2} \right)^{\binom{1}{k}} \right) /$$

$$\left(17 \pi^2 \left(1 + \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \left(\frac{3}{16} \right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2} \right)^{-k} \left(\frac{1}{2} \right)^{\binom{1}{k}} \right) \right)^7$$

$$\begin{aligned}
& \left(\left(42 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) + \frac{5 \times 16 e^{2 \times 0.9891173522430000}}{\pi^2} \right) \right. \\
& \quad \left. e^{4 \times 0.9891173522430000} \right) / \left(34 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) \right)^7 = \\
& \left(40 e^{5.934704113458000} + 21 e^{3.956469408972000} \pi^2 + 21 e^{3.956469408972000} \pi^2 \right. \\
& \quad \left. \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \frac{\left(-\frac{3}{16}\right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2}\right)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) / \\
& \quad \left(17 \pi^2 \left(1 + \sqrt{-\frac{16 e^{1.978234704486000}}{3 \pi^2}} \sum_{k=0}^{\infty} \frac{\left(-\frac{3}{16}\right)^k \left(-\frac{e^{1.978234704486000}}{\pi^2}\right)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \right)^7 \\
& \left(\left(42 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) + \frac{5 \times 16 e^{2 \times 0.9891173522430000}}{\pi^2} \right) \right. \\
& \quad \left. e^{4 \times 0.9891173522430000} \right) / \left(34 \left(1 + \sqrt{1 - \frac{16 e^{2 \times 0.9891173522430000}}{3 \pi^2}} \right) \right)^7 = \\
& \left(40 e^{5.934704113458000} + 21 e^{3.956469408972000} \pi^2 + 21 e^{3.956469408972000} \right. \\
& \quad \left. \pi^2 \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 - \frac{16 e^{1.978234704486000}}{3 \pi^2} - z_0\right)^k z_0^{-k}}{k!} \right) / \\
& \quad \left(17 \pi^2 \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 - \frac{16 e^{1.978234704486000}}{3 \pi^2} - z_0\right)^k z_0^{-k}}{k!} \right) \right)^7
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

Now, we have:

$$e^{2C} = \frac{2\xi e^{-\frac{\phi}{2}}}{1 + \sqrt{1 + \frac{\xi\Lambda}{3} e^{2\phi}}}, \quad (2.9)$$

$$\frac{h^2}{32} = \frac{e^{-4\phi}}{\left[1 + \sqrt{1 + \frac{\Lambda}{3} e^{2\phi}}\right]^7} \left[42 \left(1 + \sqrt{1 + \frac{\Lambda}{3} e^{2\phi}}\right) - 13\Lambda e^{2\phi}\right]. \quad (2.10)$$

For:

$$\xi = 1$$

$$\Lambda \simeq \frac{4\pi^2}{25}$$

$$\phi = 0.989117352243$$

From

$$e^{2C} = \frac{2\xi e^{-\frac{\phi}{2}}}{1 + \sqrt{1 + \frac{\xi\Lambda}{3} e^{2\phi}}},$$

we obtain:

$$\frac{((2 * e^{(-0.989117352243/2)}))}{((((1 + \sqrt{((1 + 1/3 * (4\pi^2)/25 * e^{(2 * 0.989117352243)}))}))))}$$

Input interpretation:

$$\frac{2 e^{-0.989117352243/2}}{1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}}}$$

Result:

0.382082347529...

0.382082347529....

Series representations:

$$\frac{2 e^{-0.9891173522430000/2}}{1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}}} = 2 / \left(e^{0.4945586761215000} \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(\frac{1}{2} \right)_k \right) \right)$$

$$\frac{2 e^{-0.9891173522430000/2}}{1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}}} = 2 / \left(e^{0.4945586761215000} \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4} \right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2} \right)_k}{k!} \right) \right)$$

$$\frac{2 e^{-0.9891173522430000/2}}{1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}}} = \frac{2}{e^{0.4945586761215000} \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2} \right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} z_0 \right)^k z_0^{-k}}{k!} \right)}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

From which:

$$1 + 1 / (((4 * ((2 * e^{(-0.989117352243/2)})) / (((1 + \sqrt{((1 + 1/3 * (4 \pi^2)/25 * e^{(2 * 0.989117352243))}))))))))))$$

Input interpretation:

$$1 + \frac{1}{4 \times \frac{2 e^{-0.989117352243/2}}{1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}}}}$$

Result:

1.65430921270...

1.6543092..... We note that, the result 1.6543092... is very near to the 14th root of the following Ramanujan's class invariant $Q = (G_{505}/G_{101/5})^3 = 1164.2696$ i.e. 1.65578...

Indeed:

$$G_{505} = P^{-1/4} Q^{1/6} = (\sqrt{5} + 2)^{1/2} \left(\frac{\sqrt{5} + 1}{2} \right)^{1/4} (\sqrt{101} + 10)^{1/4} \\ \times \left((130\sqrt{5} + 29\sqrt{101}) + \sqrt{169440 + 7540\sqrt{505}} \right)^{1/6}.$$

Thus, it remains to show that

$$(130\sqrt{5} + 29\sqrt{101}) + \sqrt{169440 + 7540\sqrt{505}} = \left(\sqrt{\frac{113 + 5\sqrt{505}}{8}} + \sqrt{\frac{105 + 5\sqrt{505}}{8}} \right)^3,$$

which is straightforward. $\square$

$$\sqrt[14]{\left(\sqrt{\frac{113 + 5\sqrt{505}}{8}} + \sqrt{\frac{105 + 5\sqrt{505}}{8}} \right)^3} = 1,65578 \dots$$

Series representations:

$$1 + \frac{1}{\frac{4(2e^{-0.9891173522430000/2})}{1 + \sqrt{1 + \frac{(4\pi^2)e^{2 \times 0.9891173522430000}}{3 \times 25}}}} = \\ 1 + \frac{e^{0.4945586761215000}}{8} + \frac{1}{8} e^{0.4945586761215000} \sqrt{\frac{4e^{1.978234704486000} \pi^2}{75}} \\ \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \binom{\frac{1}{2}}{k}$$

$$\begin{aligned}
& 1 + \frac{1}{4 \left(2 e^{-0.9891173522430000/2} \right)} = \\
& \frac{1}{1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}}} \\
& 1 + \frac{e^{0.4945586761215000}}{8} + \frac{1}{8} e^{0.4945586761215000} \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \\
& \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(-\frac{1}{2} \right)_k}{k!} \\
& 1 + \frac{1}{4 \left(2 e^{-0.9891173522430000/2} \right)} = 1 + \frac{e^{0.4945586761215000}}{8} + \\
& \frac{1}{8} e^{0.4945586761215000} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2} \right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0 \right)^k z_0^{-k}}{k!} \\
& \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))
\end{aligned}$$

And from

$$\frac{h^2}{32} = \frac{e^{-4\phi}}{\left[1 + \sqrt{1 + \frac{\Lambda}{3} e^{2\phi}} \right]^7} \left[42 \left(1 + \sqrt{1 + \frac{\Lambda}{3} e^{2\phi}} \right) - 13 \Lambda e^{2\phi} \right].$$

we obtain:

$$\begin{aligned}
& e^{(-4 \times 0.989117352243) / [1 + \sqrt{((1 + 1/3 \times (4 \pi^2)/25 \times e^{(2 \times 0.989117352243))})}]^7 \times} \\
& [42(1 + \sqrt{((1 + 1/3 \times (4 \pi^2)/25 \times e^{(2 \times 0.989117352243))})} - \\
& 13 \times (4 \pi^2)/25 \times e^{(2 \times 0.989117352243)}]
\end{aligned}$$

Input interpretation:

$$\frac{e^{-4 \times 0.989117352243}}{\left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2)\right) e^{2 \times 0.989117352243}}\right)^7 \left(42 \left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2)\right) e^{2 \times 0.989117352243}}\right) - 13 \left(\frac{1}{25} (4 \pi^2)\right) e^{2 \times 0.989117352243}\right)}$$

Result:

-0.034547055658...

-0.034547055658...

Series representations:

$$\left(\left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) e^{-4 \times 0.9891173522430000} \right) / \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 =$$

$$- \left(\left(42 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - 25 e^{1.978234704486000} \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right)^k \right) \right) / \left(25 e^{5.934704113458000} \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right)^k \right) \right)^7 \right)$$

$$\begin{aligned}
& \left(\left(42 \left(1 + \sqrt{1 + \frac{(4\pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \frac{1}{25} (4\pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right. \right. \\
& \quad \left. \left. e^{-4 \times 0.9891173522430000} \right) / \left(1 + \sqrt{1 + \frac{(4\pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 = \right. \\
& \quad - \left(\left(42 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - \right. \right. \right. \\
& \quad \left. \left. 25 e^{1.978234704486000} \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \right) / \left(25 e^{5.934704113458000} \right. \\
& \quad \left. \left. \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right)^7 \right) \right) \\
& \left(\left(42 \left(1 + \sqrt{1 + \frac{(4\pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \frac{1}{25} (4\pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right. \\
& \quad \left. e^{-4 \times 0.9891173522430000} \right) / \left(1 + \sqrt{1 + \frac{(4\pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 = \\
& \quad - \left(\left(42 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - 25 e^{1.978234704486000} \right. \right. \right. \\
& \quad \left. \left. \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right) \right) / \left(25 \right. \\
& \quad \left. e^{5.934704113458000} \right. \\
& \quad \left. \left. \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right)^7 \right) \right) \\
& \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))
\end{aligned}$$

From which:

$$\begin{aligned}
& 47 * 1 / (((-1 / (((((e^{(-4 * 0.989117352243)} / \\
& [1 + \sqrt{((1 + 1/3 * (4\pi^2)/25 * e^{(2 * 0.989117352243)}))])^7 * \\
& [42(1 + \sqrt{((1 + 1/3 * (4\pi^2)/25 * e^{(2 * 0.989117352243)}))}) - \\
& 13 * (4\pi^2)/25 * e^{(2 * 0.989117352243)}])))))))
\end{aligned}$$

Input interpretation:

$$47 \left(- \left(1 / 1 / \left(\frac{e^{-4 \times 0.989117352243}}{\left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right)^7} \right. \right. \right. \\ \left. \left. \left(42 \left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right) - \right. \right. \right. \\ \left. \left. \left. 13 \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243} \right) \right) \right) \right)$$

Result:

1.6237116159...

1.6237116159.... result that is an approximation to the value of the golden ratio
1.618033988749...

Series representations:

$$- \left(47 / 1 / \left(e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right) - \right. \right. \right. \\ \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\ \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 = \\ \left(1974 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - \right. \right. \\ \left. \left. 25 e^{1.978234704486000} \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\ \left. \left. \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right) \right) \right) / \left(25 e^{5.934704113458000} \right. \\ \left. \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right) \right) \right)^7$$

$$\begin{aligned}
& - \left(47 / 1 / \left(e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \right. \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg) = \\
& \left(1974 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - \right. \right. \\
& \quad 25 e^{1.978234704486000} \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \\
& \quad \left. \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \Bigg) / \left(25 e^{5.934704113458000} \right. \\
& \quad \left. \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right)^7 \right) \\
& - \left(47 / 1 / \left(e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \right. \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg) = \\
& \left(1974 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - 25 e^{1.978234704486000} \right. \right. \\
& \quad \left. \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right) \Bigg) / \left(25 e^{5.934704113458000} \right. \\
& \quad \left. \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right)^7 \right) \\
& \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))
\end{aligned}$$

And again:

$$32((((e^{(-4*0.989117352243)} / [1+\sqrt{((1+1/3*(4\pi^2)/25*e^{(2*0.989117352243)})})})]^7 * [42(1+\sqrt{((1+1/3*(4\pi^2)/25*e^{(2*0.989117352243)})})})-13*(4\pi^2)/25*e^{(2*0.989117352243)})])])])$$

Input interpretation:

$$32 \left(\frac{e^{-4 \times 0.989117352243}}{\left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right)^7} \left(42 \left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right) - 13 \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243} \right) \right)$$

Result:

-1.1055057810...

-1.1055057810....

We note that the result -1.1055057810.... is very near to the value of Cosmological Constant, less 10^{-52} , thence 1.1056, with minus sign

Series representations:

$$\begin{aligned}
 & \left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \right. \right. \right. \\
 & \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
 & \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 = \\
 & - \left(\left(1344 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - \right. \right. \right. \\
 & \quad \left. \left. \left. 25 e^{1.978234704486000} \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \right. \\
 & \quad \left. \left. \left. \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k (e^{1.978234704486000} \pi^2)^{-k} \binom{\frac{1}{2}}{k} \right) \right) / \left(25 e^{5.934704113458000} \right. \right. \\
 & \quad \left. \left. \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k (e^{1.978234704486000} \pi^2)^{-k} \binom{\frac{1}{2}}{k} \right)^7 \right) \right)
 \end{aligned}$$

$$\begin{aligned}
& \left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 = \\
& - \left(\left(1344 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - \right. \right. \right. \\
& \quad \left. 25 e^{1.978234704486000} \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \right) / \left(25 e^{5.934704113458000} \right. \\
& \quad \left. \left. \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) \right)^7 \right) \right)
\end{aligned}$$

$$\begin{aligned}
& \left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 = \\
& - \left(\left(1344 \left(-25 e^{1.978234704486000} + 52 e^{3.956469408972000} \pi^2 - 25 e^{1.978234704486000} \right. \right. \right. \\
& \quad \left. \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right) \right) / \left(25 \right. \\
& \quad \left. e^{5.934704113458000} \right. \\
& \quad \left. \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right)^7 \right) \right)
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

And:

$$- [32 \left(\frac{e^{-4 \times 0.989117352243}}{\left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right)^7} \right. \\ \left. [42 \left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right) - 13 \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}] \right)^5$$

Input interpretation:

$$- \left[32 \left(\frac{e^{-4 \times 0.989117352243}}{\left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right)^7} \right. \right. \\ \left. \left(42 \left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right) - \right. \right. \\ \left. \left. \left. 13 \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243} \right) \right)^5 \right]$$

Result:

1.651220569...

1.651220569.... result very near to the 14th root of the following Ramanujan's class invariant $Q = (G_{505}/G_{101/5})^3 = 1164.2696$ i.e. 1.65578...

Series representations:

$$\begin{aligned}
& - \left(\left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right. \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg)^5 = \\
& \left(4385270057140224 \left(-25 + 52 e^{1.978234704486000} \pi^2 - 25 \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right) \right)^5 \right) / \\
& \left(9765625 e^{19.78234704486000} \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right) \right)^{35} \right)
\end{aligned}$$

$$\begin{aligned}
& - \left(\left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right) - \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg)^5 = \\
& \left(4385270057140224 \left(-25 + 52 e^{1.978234704486000} \pi^2 - 25 \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right)^5 \right) / \\
& \quad \left(9765625 e^{19.78234704486000} \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right)^{35} \right)
\end{aligned}$$

$$\begin{aligned}
& - \left(\left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right) - \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg)^5 = \\
& \left(4385270057140224 \left(-25 + 52 e^{1.978234704486000} \pi^2 - \right. \right. \\
& \quad \left. \left. 25 \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right)^5 \right) / \\
& \quad \left(9765625 e^{19.78234704486000} \right. \\
& \quad \left. \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right)^{35} \right)
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

We obtain also:

$$-\left[32\left(\frac{e^{-4 \times 0.989117352243}}{\left(1+\sqrt{1+\frac{1}{3}\left(\frac{1}{25}\left(4 \pi^2\right) e^{2 \times 0.989117352243}}\right)^7}\right)}\right)^7 \times \left[42\left(1+\sqrt{1+\frac{1}{3}\left(\frac{1}{25}\left(4 \pi^2\right) e^{2 \times 0.989117352243}}\right)}\right)-13\left(\frac{1}{25}\left(4 \pi^2\right) e^{2 \times 0.989117352243}\right)\right]\right)^{1 / 2}$$

Input interpretation:

$$-\sqrt{\left(32\left(\frac{e^{-4 \times 0.989117352243}}{\left(1+\sqrt{1+\frac{1}{3}\left(\frac{1}{25}\left(4 \pi^2\right) e^{2 \times 0.989117352243}}\right)^7}\right)}\right)^7 \times \left[42\left(1+\sqrt{1+\frac{1}{3}\left(\frac{1}{25}\left(4 \pi^2\right) e^{2 \times 0.989117352243}}\right)}\right)-13\left(\frac{1}{25}\left(4 \pi^2\right) e^{2 \times 0.989117352243}\right)\right]\right)^{1 / 2}}$$

Result:

$$-0.10514303501 \dots i$$

Polar coordinates:

$$r=1.05143035007 \text { (radius), } \theta=-90^{\circ} \text { (angle)}$$

$$1.05143035007$$

Series representations:

$$\begin{aligned}
 & - \sqrt{\left(\left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right) - \right. \right. \right. \\
 & \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
 & \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg) = -\frac{8}{5} \sqrt{21} \\
 & \sqrt{\left(\left(25 - 52 e^{1.978234704486000} \pi^2 + 25 \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\
 & \quad \left. \left. \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(\frac{1}{2} \right) \right) \right) / \left(e^{3.956469408972000} \right. \\
 & \quad \left. \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(\frac{1}{2} \right) \right)^7 \right) \Bigg)
 \end{aligned}$$

$$\begin{aligned}
& - \sqrt{\left(\left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \right. \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg) = -\frac{8}{5} \sqrt{21} \\
& \sqrt{\left(\left(25 - 52 e^{1.978234704486000} \pi^2 + 25 \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \\
& \quad \left. \left. \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right) / \right. \\
& \quad \left. \left(e^{3.956469408972000} \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \right. \\
& \quad \left. \left. \left. \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4}\right)^k (e^{1.978234704486000} \pi^2)^{-k} \left(-\frac{1}{2}\right)_k}{k!} \right)^7 \right) \right) \Bigg) \\
& - \sqrt{\left(\left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} - \right. \right. \right. \right. \\
& \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \\
& \quad \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \Bigg) = \\
& -\frac{8}{5} \sqrt{21} \sqrt{\left(\left(25 - 52 e^{1.978234704486000} \pi^2 + \right. \right. \\
& \quad \left. \left. 25 \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right) / \right. \\
& \quad \left(e^{3.956469408972000} \right. \\
& \quad \left. \left(1 + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \right)^7 \right) \Bigg) \Bigg)
\end{aligned}$$

for (not $(z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0)$)

$$1 / -[32((((e^{(-4*0.989117352243)} / [1+\sqrt{(1+1/3*(4\pi^2)/25*e^{(2*0.989117352243)}})]^7 * [42(1+\sqrt{(1+1/3*(4\pi^2)/25*e^{(2*0.989117352243)}})]-13*(4\pi^2)/25*e^{(2*0.989117352243)})))]^1/2$$

Input interpretation:

$$- \left[1 / \left(\sqrt[3]{32 \left(\frac{e^{-4 \times 0.989117352243}}{\left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right)^7} \right. \right. \right. \\ \left. \left. \left(42 \left(1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}} \right) - \right. \right. \right. \\ \left. \left. \left. 13 \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243} \right) \right) \right) \right]$$

Result:

0.95108534763... *i*

Polar coordinates:

$r = 0.95108534763$ (radius), $\theta = 90^\circ$ (angle)

0.95108534763

We know that the primordial fluctuations are consistent with Gaussian purely adiabatic scalar perturbations characterized by a power spectrum with a spectral index $n_s = 0.965 \pm 0.004$, consistent with the predictions of slow-roll, single-field, inflation.

Thence 0.95108534763 is a result very near to the spectral index n_s , to the mesonic Regge slope, to the inflaton value at the end of the inflation 0.9402 and to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}}-\varphi+1} = 1 - \frac{e^{-\pi}}{1 + \frac{e^{-2\pi}}{1 + \frac{e^{-3\pi}}{1 + \frac{e^{-4\pi}}{1 + \dots}}}} \approx 0.9568666373$$

Series representations:

$$\begin{aligned} & - \left[1 / \left(\sqrt{\left(32 e^{-4 \times 0.9891173522430000} \left(42 \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right) - \right. \right. \right. \right. \\ & \quad \left. \left. \left. \frac{1}{25} (4 \pi^2) 13 e^{2 \times 0.9891173522430000} \right) \right) \right) / \right. \\ & \quad \left. \left(1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}} \right)^7 \right) \right) = \\ & - \left[5 / \left(8 \sqrt{21} \sqrt{\left(25 - 52 e^{1.978234704486000} \pi^2 + 25 \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right. \right. \right. \\ & \quad \left. \left. \left. \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right) \right) \right) / \right. \\ & \quad \left. \left(e^{3.956469408972000} \left(1 + \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75}} \right) \right. \right. \\ & \quad \left. \left. \left. \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right) \right) \right) \right) \right) \right) \end{aligned}$$

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for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

$$= -0.034547055658\dots$$

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$$1+1/(((4((2*e^{(-0.989117352243/2)})) / (((1+sqrt(((1+1/3*(4\pi^2)/25*e^{(2*0.989117352243)})))))))))) + (-0.034547055658)$$

Input interpretation:

$$1 + \frac{1}{4 \times \frac{2 e^{-0.989117352243/2}}{1 + \sqrt{1 + \frac{1}{3} \left(\frac{1}{25} (4 \pi^2) \right) e^{2 \times 0.989117352243}}}} - 0.034547055658$$

Result:

1.61976215705...

1.61976215705..... result that is a very good approximation to the value of the golden ratio 1.618033988749...

Series representations:

$$1 + \frac{1}{4 \left(2 e^{-0.9891173522430000/2} \right)} - 0.0345470556580000 = \frac{1}{1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}}} \\ 0.9654529443420000 + \frac{e^{0.4945586761215000}}{8} + \frac{1}{8} e^{0.4945586761215000} \\ \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75} \sum_{k=0}^{\infty} \left(\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(\frac{1}{2} \right)_k}$$

$$1 + \frac{1}{4 \left(2 e^{-0.9891173522430000/2} \right)} - 0.0345470556580000 = \frac{1}{1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}}} \\ 0.9654529443420000 + \frac{e^{0.4945586761215000}}{8} + \frac{1}{8} e^{0.4945586761215000} \\ \sqrt{\frac{4 e^{1.978234704486000} \pi^2}{75} \sum_{k=0}^{\infty} \frac{\left(-\frac{75}{4} \right)^k \left(e^{1.978234704486000} \pi^2 \right)^{-k} \left(-\frac{1}{2} \right)_k}{k!}}$$

$$\begin{aligned}
& 1 + \frac{1}{4 \left(2 e^{-0.9891173522430000/2} \right)} - 0.0345470556580000 = \\
& \frac{1 + \sqrt{1 + \frac{(4 \pi^2) e^{2 \times 0.9891173522430000}}{3 \times 25}}}{0.9654529443420000 + \frac{e^{0.4945586761215000}}{8} +} \\
& \frac{1}{8} e^{0.4945586761215000} \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(1 + \frac{4 e^{1.978234704486000} \pi^2}{75} - z_0\right)^k z_0^{-k}}{k!} \\
& \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))
\end{aligned}$$

From

Properties of Nilpotent Supergravity

E. Dudas, S. Ferrara, A. Kehagias and A. Sagnotti - arXiv:1507.07842v2 [hep-th] 14 Sep 2015

We have that:

Cosmological inflation with a tiny tensor-to-scalar ratio r , consistently with PLANCK data, may also be described within the present framework, for instance choosing

$$\alpha(\Phi) = i M \left(\Phi + b \Phi e^{ik\Phi} \right). \quad (4.35)$$

This potential bears some similarities with the Kähler moduli inflation of [32] and with the poly-instanton inflation of [33]. One can verify that $\chi = 0$ solves the field equations, and that the potential along the $\chi = 0$ trajectory is now

$$V = \frac{M^2}{3} \left(1 - a \phi e^{-\gamma \phi} \right)^2. \quad (4.36)$$

We analyzing the following equation:

$$V = \frac{M^2}{3} \left(1 - a \phi e^{-\gamma \phi} \right)^2.$$

$$\phi = \varphi - \frac{\sqrt{6}}{k},$$

$$a = \frac{b\gamma}{e} < 0, \quad \gamma = \frac{k}{\sqrt{6}} < 0.$$

We have:

$$(M^2)/3 * [1 - (b/\text{euler number} * k/\sqrt{6}) * (\varphi - \sqrt{6}/k) * \exp(-(k/\sqrt{6})(\varphi - \sqrt{6}/k))]^2$$

i.e.

$$V = (M^2)/3 * [1 - (b/\text{euler number} * k/\sqrt{6}) * (\varphi - \sqrt{6}/k) * \exp(-(k/\sqrt{6})(\varphi - \sqrt{6}/k))]^2$$

For $k = 2$ and $\varphi = 0.9991104684$, that is the value of the scalar field that is equal to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\sqrt{5}}}{1 + \sqrt[5]{\sqrt{\varphi^5 \sqrt[4]{5^3} - 1}} - \varphi + 1} = 1 - \frac{e^{-\pi\sqrt{5}}}{1 + \frac{e^{-2\pi\sqrt{5}}}{1 + \frac{e^{-3\pi\sqrt{5}}}{1 + \frac{e^{-4\pi\sqrt{5}}}{1 + \dots}}}} \approx 0.9991104684$$

we obtain:

$$V = (M^2)/3 * [1 - (b/\text{euler number} * 2/\sqrt{6}) * (0.9991104684 - \sqrt{6}/2) * \exp(-(2/\sqrt{6})(0.9991104684 - \sqrt{6}/2))]^2$$

Input interpretation:

$$V = \frac{M^2}{3} \left(1 - \left(\frac{b}{e} \times \frac{2}{\sqrt{6}} \right) \left(0.9991104684 - \frac{\sqrt{6}}{2} \right) \exp \left(- \frac{2}{\sqrt{6}} \left(0.9991104684 - \frac{\sqrt{6}}{2} \right) \right) \right)^2$$

Result:

$$V = \frac{1}{3} (0.0814845 b + 1)^2 M^2$$

Solutions:

$$b = \frac{225.913 \left(-0.054323 M^2 \pm 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} \quad (M \neq 0)$$

Alternate forms:

$$V = 0.00221324 (b + 12.2723)^2 M^2$$

$$V = 0.00221324 (b^2 M^2 + 24.5445 b M^2 + 150.609 M^2)$$

$$-0.00221324 b^2 M^2 - 0.054323 b M^2 - \frac{M^2}{3} + V = 0$$

Expanded form:

$$V = 0.00221324 b^2 M^2 + 0.054323 b M^2 + \frac{M^2}{3}$$

Alternate form assuming b, M, and V are positive:

$$V = 0.00221324 (b + 12.2723)^2 M^2$$

Alternate form assuming b, M, and V are real:

$$V = 0.00221324 b^2 M^2 + 0.054323 b M^2 + 0.333333 M^2 + 0$$

Derivative:

$$\frac{\partial}{\partial b} \left(\frac{1}{3} (0.0814845 b + 1)^2 M^2 \right) = 0.054323 (0.0814845 b + 1) M^2$$

Implicit derivatives

$$\frac{\partial b(M, V)}{\partial V} = \frac{154317775011120075}{36961748(226802245 + 18480874b)M^2}$$

$$\frac{\partial b(M, V)}{\partial M} = -\frac{\frac{226802245}{18480874} + b}{M}$$

$$\frac{\partial M(b, V)}{\partial V} = \frac{154317775011120075}{2(226802245 + 18480874b)^2 M}$$

$$\frac{\partial M(b, V)}{\partial b} = -\frac{18480874M}{226802245 + 18480874b}$$

$$\frac{\partial V(b, M)}{\partial M} = \frac{2(226802245 + 18480874b)^2 M}{154317775011120075}$$

$$\frac{\partial V(b, M)}{\partial b} = \frac{36961748(226802245 + 18480874b)M^2}{154317775011120075}$$

Global minimum:

$$\min\left\{\frac{1}{3}(0.0814845b + 1)^2 M^2\right\} = 0 \text{ at } (b, M) = (-16, 0)$$

Global minima:

$$\min \left\{ \frac{1}{3} M^2 \left(1 - \frac{(b/2) \left(0.9991104684 - \frac{\sqrt{6}}{2} \right) \exp \left(-\frac{2 \left(0.9991104684 - \frac{\sqrt{6}}{2} \right)}{\sqrt{6}} \right)}{e \sqrt{6}} \right)^2 \right\} = 0$$

for $b = -\frac{226802245}{18480874}$

$$\min \left\{ \frac{1}{3} M^2 \left(1 - \frac{(b/2) \left(0.9991104684 - \frac{\sqrt{6}}{2} \right) \exp \left(-\frac{2 \left(0.9991104684 - \frac{\sqrt{6}}{2} \right)}{\sqrt{6}} \right)}{e \sqrt{6}} \right)^2 \right\} = 0$$

for $M = 0$

From:

$$b = \frac{225.913 \left(-0.054323 M^2 \pm 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} \quad (M \neq 0)$$

we obtain

$$(225.913 (-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4}))/M^2$$

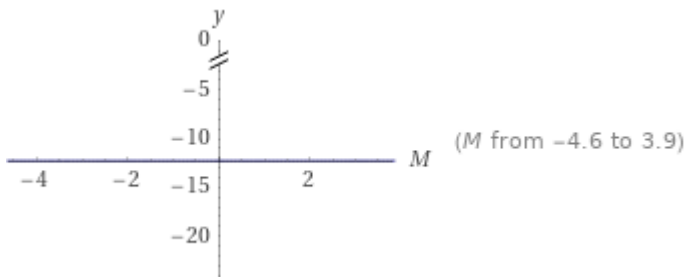
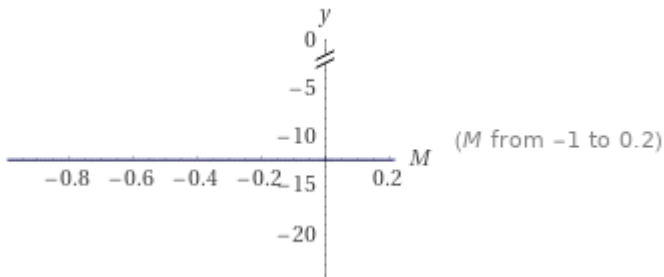
Input interpretation:

$$\frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2}$$

Result:

$$\frac{225.913 \left(6.58545 \times 10^{-10} \sqrt{M^4} - 0.054323 M^2 \right)}{M^2}$$

Plots:



Alternate form assuming M is real:

$$-12.2723$$

-12.2723 result very near to the black hole entropy value $12.1904 = \ln(196884)$

Alternate forms:

$$-\frac{12.2723 \left(M^2 - 1.21228 \times 10^{-8} \sqrt{M^4} \right)}{M^2}$$

$$\frac{1.48774 \times 10^{-7} \sqrt{M^4} - 12.2723 M^2}{M^2}$$

Expanded form:

$$\frac{1.48774 \times 10^{-7} \sqrt{M^4}}{M^2} - 12.2723$$

Property as a function:

Parity

even

Series expansion at $M = 0$:

$$\left(\frac{1.48774 \times 10^{-7} \sqrt{M^4}}{M^2} - 12.2723 \right) + O(M^6)$$

(generalized Puiseux series)

Series expansion at $M = \infty$:

$$-12.2723$$

Derivative:

$$\frac{d}{dM} \left(\frac{225.913 \left(6.58545 \times 10^{-10} \sqrt{M^4} - 0.054323 M^2 \right)}{M^2} \right) = \frac{3.55271 \times 10^{-15}}{M}$$

Indefinite integral:

$$\int \frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} dM =$$

$$\frac{1.48774 \times 10^{-7} \sqrt{M^4}}{M} - 12.2723 M + \text{constant}$$

Global maximum:

$$\max \left\{ \frac{225.913 \left(6.58545 \times 10^{-10} \sqrt{M^4} - 0.054323 M^2 \right)}{M^2} \right\} =$$

$$-\frac{140\,119\,826\,723\,990\,341\,497\,649}{11\,417\,594\,849\,251\,000\,000\,000} \text{ at } M = -1$$

Global minimum:

$$\min \left\{ \frac{225.913 \left(6.58545 \times 10^{-10} \sqrt{M^4} - 0.054323 M^2 \right)}{M^2} \right\} =$$

$$-\frac{140\,119\,826\,723\,990\,341\,497\,649}{11\,417\,594\,849\,251\,000\,000\,000} \text{ at } M = -1$$

Limit:

$$\lim_{M \rightarrow \pm\infty} \frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} = -12.2723$$

Definite integral after subtraction of diverging parts:

$$\int_0^\infty \left(\frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} - -12.2723 \right) dM = 0$$

From b that is equal to

$$\frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2}$$

From:

$$V = \frac{1}{3} (0.0814845 b + 1)^2 M^2$$

we obtain:

$$\frac{1}{3} (0.0814845 ((225.913 (-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4}))/M^2) + 1)^2 M^2$$

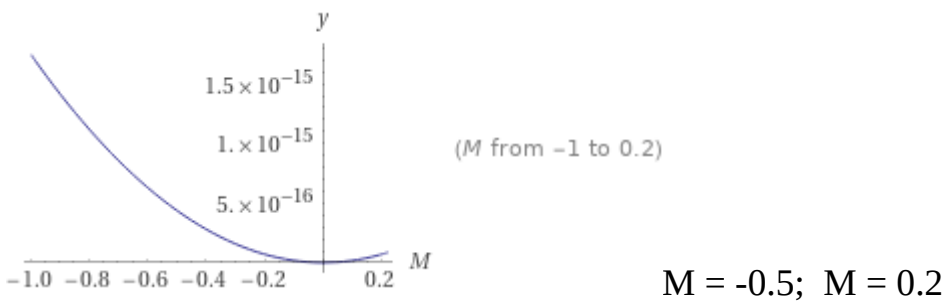
Input interpretation:

$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} + 1 \right)^2 M^2$$

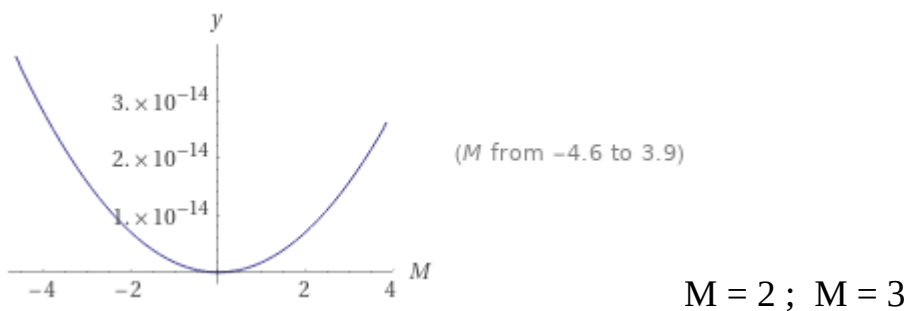
Result:

0

Plots: (possible mathematical connection with an open string)



(possible mathematical connection with an open string)



Root:

$$M = 0$$

Property as a function:

Parity

even

Series expansion at $M = 0$:

$$O(M^{62194})$$

(Taylor series)

Series expansion at $M = \infty$:

$$1.75541 \times 10^{-15} M^2 + O\left(\left(\frac{1}{M}\right)^{62194}\right)$$

(Taylor series)

Definite integral after subtraction of diverging parts:

$$\int_0^\infty \left(\frac{1}{3} M^2 \left(1 + \frac{18.4084 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} \right)^2 - 1.75541 \times 10^{-15} M^2 \right) dM = 0$$

For $M = -0.5$, we obtain:

$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} + 1 \right)^2 M^2$$

$$\frac{1}{3} (0.0814845 ((225.913 (-0.054323 (-0.5)^2 + 6.58545 \times 10^{-10} \sqrt{(-0.5)^4}))/(-0.5)^2 + 1)^2 * (-0.5^2)$$

$$\frac{1}{3} \left(\frac{0.0814845 \times \frac{225.913 \left(-0.054323 (-0.5)^2 + 6.58545 \times 10^{-10} \sqrt{(-0.5)^4} \right)}{(-0.5)^2} + 1}{(-0.5^2)} \right)^2$$
$$-4.38851344947464545348970783378088020833333333333333333\ldots \times 10^{-16}$$
$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} + 1 \right)^2 M^2$$

$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 \times 0.2^2 + 6.58545 \times 10^{-10} \sqrt{0.2^4} \right)}{0.2^2} + 1 \right)^2 \times 0.2^2$$

$$7.021621519159432725583532534049408333333333333333333333 \times 10^{-17}$$

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For M = 3:

$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} + 1 \right)^2 M^2$$

$$\frac{1}{3} (0.0814845 ((225.913 (-0.054323 3^2 + 6.58545 \times 10^{-10} \sqrt{3^4}))/3^2) + 1)^2 3^2$$

Input interpretation:

$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 \times 3^2 + 6.58545 \times 10^{-10} \sqrt{3^4} \right)}{3^2} + 1 \right)^2 \times 3^2$$

Result:

$$1.579864841810872363256294820161116875 \times 10^{-14}$$

$$1.57986484181 \times 10^{-14}$$

For M = 2:

$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 M^2 + 6.58545 \times 10^{-10} \sqrt{M^4} \right)}{M^2} + 1 \right)^2 M^2$$

$$\frac{1}{3} (0.0814845 ((225.913 (-0.054323 2^2 + 6.58545 \times 10^{-10} \sqrt{2^4}))/2^2) + 1)^2 2^2$$

Input interpretation:

$$\frac{1}{3} \left(0.0814845 \times \frac{225.913 \left(-0.054323 \times 2^2 + 6.58545 \times 10^{-10} \sqrt{2^4} \right)}{2^2} + 1 \right)^2 \times 2^2$$

Result:

$$7.02162151915943272558353253404940833333333333333333333333333333 \times 10^{-15}$$

$$7.021621519 \times 10^{-15}$$

From the four results

7.021621519*10⁻¹⁵ ; 1.57986484181*10⁻¹⁴ ; 7.021621519159*10⁻¹⁷ ;
-4.38851344947*10⁻¹⁶

we obtain, after some calculations:

$$\sqrt{1/(2\pi)(7.021621519 \times 10^{-15} + 1.57986484181 \times 10^{-14} + 7.021621519 \times 10^{-17} - 4.38851344947 \times 10^{-16})}$$

Input interpretation:

$$\sqrt{\left(\frac{1}{2\pi} (7.021621519 \times 10^{-15} + 1.57986484181 \times 10^{-14} + 7.021621519 \times 10^{-17} - 4.38851344947 \times 10^{-16})\right)}$$

Result:

$$5.9776991059... \times 10^{-8}$$

5.9776991059*10⁻⁸ result very near to the Planck's electric flow 5.975498×10^{-8} that is equal to the following formula:

$$\phi_P^E = \mathbf{E}_P l_P^2 = \phi_P l_P = \sqrt{\frac{\hbar c}{\epsilon_0}}$$

We note that:

$$1/55 * (((1/[(7.021621519 * 10^{-15} + 1.57986484181 * 10^{-14} + 7.021621519 * 10^{-17} - 4.38851344947 * 10^{-16})]))^{1/7} - ((\log^{5/8}(2))/(2 \cdot 2^{1/8} \cdot 3^{1/4} \cdot e \cdot \log^{3/2}(3))))))$$

Input interpretation:

$$\frac{1}{55} \left(\left(1 / (7.021621519 \times 10^{-15} + 1.57986484181 \times 10^{-14} + 7.021621519 \times 10^{-17} - 4.38851344947 \times 10^{-16}) \right)^{(1/7)} - \frac{\log^{5/8}(2)}{2 \sqrt[8]{2} \sqrt[4]{3} e \log^{3/2}(3)} \right)$$

log(x) is the natural logarithm

Result:

1.6181818182...

1.6181818182... result that is a very good approximation to the value of the golden ratio 1.618033988749...

From the Planck units:

Planck Length

$$l_P = \sqrt{\frac{4\pi\hbar G}{c^3}}$$

$5.729475 \cdot 10^{-35}$ Lorentz-Heaviside value

Planck's Electric field strength

$$\mathbf{E_P} = \frac{F_P}{q_P} = \sqrt{\frac{c^7}{16\pi^2 \epsilon_0 \hbar G^2}}$$

$1.820306 * 10^{61}$ V*m Lorentz-Heaviside value

Planck's Electric flux

$$\phi_P^E = \mathbf{E_P} l_P^2 = \phi_P l_P = \sqrt{\frac{\hbar c}{\epsilon_0}}$$

$5.975498 * 10^{-8}$ V*m Lorentz-Heaviside value

Planck's Electric potential

$$\phi_P = V_P = \frac{E_P}{q_P} = \sqrt{\frac{c^4}{4\pi \epsilon_0 G}}$$

$1.042940 * 10^{27}$ V Lorentz-Heaviside value

Relationship between Planck's Electric Flux and Planck's Electric Potential

$$E_P * I_P = (1.820306 * 10^{61}) * 5.729475 * 10^{-35}$$

Input interpretation:

$$\frac{(1.820306 \times 10^{61}) \times 5.729475}{10^{35}}$$

Result:

1 042 939 771 935 000 000 000 000 000

Scientific notation:

$$1.042939771935 \times 10^{27}$$

$$1.042939771935 * 10^{27} \approx 1.042940 * 10^{27}$$

Or:

$$E_P * I_P^2 / I_P = (5.975498 * 10^{-8}) * 1 / (5.729475 * 10^{-35})$$

Input interpretation:

$$5.975498 \times 10^{-8} \times \frac{1}{\frac{5.729475}{10^{35}}}$$

Result:

1.04293988541707573556041347592929544155441816222254220500133... × 10²⁷

$$1.042939885417 * 10^{27} \approx 1.042940 * 10^{27}$$

Acknowledgments

We would like to thank Professor **Augusto Sagnotti** theoretical physicist at Scuola Normale Superiore (Pisa – Italy) for his very useful explanations and his availability

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